

HUMMEL CHEMICAL COMPANY
185 FOUNDRY STREET
NEWARK, ESSEX COUNTY
EPA ID# NJD002174712

The Hummel Chemical Company formerly operated a chemical warehouse/distribution center out of a small industrial complex at 185 Foundry Street in Newark, Essex County. It is also likely that operations at the site included reacting and mixing of chemicals, most of which were in powdered form. Hummel Chemical was located in Newark until the mid 1960's when operations were transferred to South Plainfield, New Jersey. It is not known how long the company operated at the Newark site. It is also not known what buildings within the complex the company may have occupied. Officials of Hummel Chemical and the Norpak Corporation/KEM Realty Company, who formerly owned a majority of the property in the complex, were questioned as to what buildings Hummel Chemical may have occupied, but no records with that information are available.

Very little information is available concerning the company's operations in Newark. According to EPA's publication, "Dioxins", published in 1980, potential dioxin precursors such as 2,4-dinitrophenoxyethanol, 3,5-dinitrosalicylic acid, picric acid and hexachlorobenzene were present at Hummel Chemical Newark plant. However, it is unknown what other types of chemicals may have been present at the site or what types of storage/disposal methods were used by the company.

A review of information concerning the company's South Plainfield facility had revealed that poor housekeeping and operational practices had led to fires, explosions and employee injury, as well as groundwater, surface water and soil contamination. Because of the company's disregard for employee and public health and safety, as well as the lack of concern for the environment as shown at their South Plainfield facility, it is probable that a similar sentiment existed at the company when they operated in Newark. Therefore, it is likely that improper disposal of hazardous substances also occurred at the Newark facility. Because dioxin type compounds like those which were present at Hummel Chemical's Newark facility do not readily migrate vertically through the soil column, it is likely that many of these substances may still be present near the soil surface. This is cause for concern at the site, as well as adjacent properties, many of which are vacant and may have also been used for disposal, are easily accessible to the public. It should also be noted that since many of the substances used by Hummel Chemical were in powdered form, and dioxin type compounds have an affinity to bind with soil particles, it is possible for contaminants to be transported offsite as dust particles or aerosols. This would allow contaminants to spread throughout the area and possibly contaminate residential areas. The nearest residential area lies only .5 miles west of the site. Since storm drains in the area discharge to the Passaic River, it is also possible for the river to be contaminated by runoff from the site. This may have a direct impact on aquatic biota in



the river because dioxin type compounds may bioaccumulate in aquatic organisms and pose a biomagnification threat, which leads to the possibility of food chain contamination. Because the dioxin type compounds do not readily migrate vertically through the soil, this also makes them readily available to terrestrial organisms. Migratory birds would seem to be the most susceptible because of the proximity of the site to the Hackensack Meadowlands. It is also possible that other hazardous substances utilized by Hummel Chemical, besides the dioxin type compounds, may have also been improperly disposed and contributed to soil and surface water contamination. Depending upon the characteristics of these substances and their ability to migrate through the soil column, it is possible groundwater contamination has occurred. Groundwater in the area, which is used only for industrial purposes, is derived from two aquifer systems. The high yield aquifer originating from the Brunswick Formation, which is the main source of groundwater in Essex County, may be contaminated by substances disposed at the site although it is relatively deep and is protected in much of the area by confining clay layers. However, the low yield aquifer existing in the unstratified drift of Pleistocene age is more likely to be affected since it exists near the surface (Attachment F).

Another cause for concern is the health of employees of the current occupant of the buildings formerly utilized by Hummel Chemical. Because of mixing operations used by the company at their South Plainfield facility which allowed chemicals to spread throughout the process buildings, it is highly likely this also occurred at Newark. If these buildings were not properly decontaminated after Hummel Chemical's departure, employees may be constantly inhaling dangerous compounds.

Although the compounds known to be present at the site are considered Class III dioxin compounds (compounds which have a very low potential to change into dioxins), a high priority for further investigation is warranted because of the lack of information available and the threats to the population and the environment. It is recommended that a site inspection be conducted as soon as possible to characterize contamination present on site. Sampling should include shallow soil samples to be analyzed for dioxins and priority pollutants plus forty, as well as deep soil samples to be analyzed for priority pollutants plus forty. Determination of sampling locations and number of samples would be based on information obtained during an on-site presampling assessment. It is also recommended that officials of Hummel Chemical physically identify the buildings which they believe the company may have occupied. Wipe samples to be analyzed for dioxins should be taken from inside these buildings to determine if residues from past operations still exist which may constitute a health hazard to current employees. Based on review of sample analyses, additional investigations, including installation of monitor wells to survey groundwater conditions may also be necessary. All potential migration pathways of substances off site, including storm drains, should also be investigated and closed off. Lastly, it should also be ensured that proper security is implemented to prevent unauthorized entry onto the site.



Preliminary Assessment

Hummel Chemical Company
185 Foundry St.
Newark, Essex Co.
NJD002174712



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

1. IDENTIFICATION

01 STATE 02 SITE NUMBER
NJ D002174712

II. SITE NAME AND LOCATION

01 SITE NAME (Agency, Department, or Organization Name of Site) Hummel Chemical Co.		02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER 185 Foundry St.			
03 CITY Newark	04 STATE NJ	05 ZIP CODE	06 COUNTY Essex	07 COUNTY CODE	08 CONG DIST
09 COORDINATES LATITUDE 40° 43' 34"		LONGITUDE 74° 08' 01"		Block Unknown Lot Unknown	

10 DIRECTIONS TO SITE (Starting from nearest public road)
New Jersey Turnpike to Exit 15E. Take Doremus Ave. and make a right onto Roanoke Ave. Follow Roanoke to Foundry St. Make a right on Foundry St. and site is approximately 1500 feet to the left.

III. RESPONSIBLE PARTIES

01 OWNER (if known) It is unknown what buildings that Hummel occupied, however the owner of the property		02 STREET (Industrial, Mining, Residential) 10 Harmich Road		
03 CITY at that time was the Norpak/KEM Realty Company.		04 STATE	05 ZIP CODE	06 TELEPHONE NUMBER ()
07 OPERATOR (If present and different from owner) Hummel Chemical Company		08 STREET (Industrial, Mining, Residential) 10 Harmich Road		
09 CITY South Plainfield		10 STATE	11 ZIP CODE 07090	12 TELEPHONE NUMBER 201 754-1800
13 TYPE OF OWNERSHIP (Check one) <input checked="" type="checkbox"/> A. PRIVATE <input type="checkbox"/> B. FEDERAL <input type="checkbox"/> C. STATE <input type="checkbox"/> D. COUNTY <input type="checkbox"/> E. MUNICIPAL <input type="checkbox"/> F. OTHER <input type="checkbox"/> G. UNKNOWN				

14 OPERATOR NOTIFICATION ON FILE (Check one)
☐ A. RCRA 3001 DATE RECEIVED MONTH DAY YEAR ☐ B. UNCONTROLLED WASTE SITE (RCRA 103) DATE RECEIVED MONTH DAY YEAR ☐ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION <input checked="" type="checkbox"/> YES DATE MONTH DAY YEAR <input type="checkbox"/> NO		02 (Check all that apply) <input type="checkbox"/> A. EPA <input type="checkbox"/> B. EPA CONTRACTOR <input type="checkbox"/> C. STATE <input type="checkbox"/> D. OTHER CONTRACTOR <input type="checkbox"/> E. LOCAL HEALTH OFFICIAL <input type="checkbox"/> F. OTHER CONTRACTOR NAME(S):		
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03 SITE STATUS (Check one) <input checked="" type="checkbox"/> A. ACTIVE <input type="checkbox"/> B. INACTIVE <input type="checkbox"/> C. UNKNOWN		04 YEARS OF OPERATION BEGINNING YEAR ENDING YEAR <input checked="" type="checkbox"/> UNKNOWN	
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05 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN OR ALLEGED
Picric acid, hexachlorobenzene, 3,5 dinitro salicylic acid and 2,4-dinitrophenoxymethanol which are all potential dioxin precursors, were known to be present at the site. It is unknown what other substances may have been present. See hazardous substance list- ing for substances which were possibly present.

06 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION
Although little is known about Hummel's operations in Newark, the disregard for the environment and public and employee health and safety at the company's South Plainfield facility leads to the likelihood that soil, groundwater and surface water contamination has also occurred at Newark.

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one) <input checked="" type="checkbox"/> A. HIGH <input type="checkbox"/> B. MEDIUM <input type="checkbox"/> C. LOW <input type="checkbox"/> D. NONE			
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VI. INFORMATION AVAILABLE FROM

01 CONTACT Robert Beretsky		02 OF (Agency or Organization) NJDEP/DHWM/BPA		03 TELEPHONE NUMBER 609 984-3014	
04 PERSON RESPONSIBLE FOR ASSESSMENT Robert Beretsky		05 AGENCY NJDEP	06 ORGANIZATION DHWM/BPA	07 TELEPHONE NUMBER 609 984-3014	08 DATE 9/11/87



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE NJ 02 SITE NUMBER D002174712

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply) <input checked="" type="checkbox"/> A SOLID <input checked="" type="checkbox"/> B POWDER, FINES <input type="checkbox"/> C SLUDGE <input type="checkbox"/> D OTHER <input type="checkbox"/> E SLURRY <input type="checkbox"/> F LIQUID <input type="checkbox"/> G GAS	02 WASTE QUANTITY AT SITE (Estimate of waste quantities must be substantiated) TONS } Unknown CUBIC YARDS } NO OF DRUMS }	03 WASTE CHARACTERISTICS (Check all that apply) <input checked="" type="checkbox"/> A TOXIC <input type="checkbox"/> B CORROSIVE <input type="checkbox"/> C RADIOACTIVE <input checked="" type="checkbox"/> D PERSISTENT <input type="checkbox"/> E SOLUBLE <input type="checkbox"/> F INFECTIOUS <input checked="" type="checkbox"/> G FLAMMABLE <input checked="" type="checkbox"/> H IGNITABLE <input type="checkbox"/> I HIGHLY VOLATILE <input type="checkbox"/> J EXPLOSIVE <input type="checkbox"/> K REACTIVE <input type="checkbox"/> L INCOMPATIBLE <input type="checkbox"/> M NOT APPLICABLE
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III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			According to EPA's "DIOXINS"
OLW	OLY WASTE			book published in 1980, 2,4
SOL	SOLVENTS			dinitrophenoxy ethanol, hexachlor-
PSD	PESTICIDES			obenzene, 3,5 dinitrosalicylic acid
OCC	OTHER ORGANIC CHEMICALS	Unknown		and picric acid were present at
OC	INORGANIC CHEMICALS			the Newark site. However it is
ACD	ACIDS			unknown how much of these
SAS	BASES			substances were present. It is
HES	HEAVY METALS			also unknown what other types of
				substances may have been present.

IV. HAZARDOUS SUBSTANCES (See Appendix for their identification CAS Number)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/ DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
OCC	2,4-Dinitrophenoxyethanol		Present on site according to EPA's "DIOXINS" book - see Attachment A		
OCC	3,5-dinitrosalicylic acid				
OCC	hexachlorobenzene	188-74-1			
OCC	picric acid				
OCC	2,4-dinitrophenol	51-28-5	These substances are used by Hummel Chemical at their South Plainfield, NJ plant. These substances were also possibly present at the Newark facility since it is believed similar operations were conducted at both facilities.		
OCC	hydrazine	302-01-2			
OCC	hexachloroethane	67-72-1			
IOC	lead nitrate	18256-98-4			
IOC	lead dioxide	7439-92-1			
IOC	lead chromate	18454-12-1			
IOC	bariumchromate	7440-47-3			
IOC	zinc oxide	7440-66-6			
OCC	ethylene glycol	107-21-1			

V. FEEDSTOCKS (See Appendix for CAS Number)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (See Appendix for identification of sources)

Attachment A - EPA - "DIOXINS" EPA-600/2-80-197



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE 02 SITE NUMBER
NJ D002174712

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply) <input type="checkbox"/> A SOLID <input type="checkbox"/> B POWDER, FINES <input type="checkbox"/> C SLUDGE <input type="checkbox"/> D OTHER _____ (Source)	02 WASTE QUANTITY AT SITE (Indicate if waste quantities listed are approximate) TONS _____ CUBIC YARDS _____ NO OF DRUMS _____	03 WASTE CHARACTERISTICS (Check all that apply) <input type="checkbox"/> A TOXIC <input type="checkbox"/> B CORROSIVE <input type="checkbox"/> C RADIOACTIVE <input type="checkbox"/> D PERSISTENT <input type="checkbox"/> E SOLUBLE <input type="checkbox"/> F INFECTIOUS <input type="checkbox"/> G FLAMMABLE <input type="checkbox"/> H IRRITABLE <input type="checkbox"/> I HIGHLY VOLATILE <input type="checkbox"/> J EXPLOSIVE <input type="checkbox"/> K REACTIVE <input type="checkbox"/> L INCOMPATIBLE <input type="checkbox"/> M NOT APPLICABLE
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III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLJ	SLUDGE			
CLW	CLAY WASTE			
SOL	SOLVENTS			
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			
OC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for Hazardous Waste CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/ DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
MES	Arsenic	7440-38-2			
OCC	Isopropanol	67-63-0			
SOL	Methanol	67-56-1	These substances are used by Hummel Chemical at their South Plainfield plant.		
ACD	Nitric acid	7697-37-2			
ACD	Oxalic acid	144-62-7	These substances were also possibly present at the Newark facility since it is believed similar operations were conducted at both sites.		
ACD	Rosin acid	999			
BAS	Sodium hydroxide	1310-73-2			
OCC	Toluene	108-88-3			
OCC	Resorcinol	108-46-3			
IOC	Cupric oxide	7440-50-8			
IOC	Antimony trisulfide	7740-58-2			
OCC	Ammonium oxalate	999			
IOC	Lead thiocyanate	592-87-0			
SOL	Acetone	67-64-1			

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (See Appendix for Hazardous Waste CAS Numbers)



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT

PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

1. IDENTIFICATION

01 STATE NJ 02 SITE NUMBER D002174712

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☒ A. GROUNDWATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☒ POTENTIAL ☐ ALLEGED

Although dioxin type compounds do not readily migrate through soil, other substances which were improperly disposed by the company may migrate through soil and contaminate groundwater.

Attachment D, E, F

01 ☒ B. SURFACE WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☒ POTENTIAL ☐ ALLEGED

Improperly disposed hazardous substances may enter the nearby Passaic River via storm drains or groundwater discharges. Storm drains in the area discharge to the river.

Attachment

01 ☐ C. CONTAMINATION OF AIR
03 POPULATION POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☐ POTENTIAL ☐ ALLEGED

Attachment C

Hazardous substances disposed by the company may become airborne as dust particles or aerosols. The company is also known to have mixed powdered chemicals in a manner which allowed the chemicals to become airborne throughout the process buildings. These chemicals could have also been transferred to the outside atmosphere via exhaust fans.

(Att. C)

01 ☐ D. FIRE/EXPLOSIVE CONDITIONS
03 POPULATION POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☐ POTENTIAL ☐ ALLEGED

The company has not been located at the Newark facility for more than twenty years, therefore a potential for fires or explosions as a result of Hummels' activities is very low.

01 ☒ E. DISPOSAL/STORAGE METHODS
03 POPULATION POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☒ POTENTIAL ☐ ALLEGED

It is unknown what type of disposal/storage methods were used by the company at the Newark facility. However, poor housekeeping and operational practices, which are a trademark of Hummel, may have lead to improper disposal on adjacent properties which are easily accessible to private citizens.

Attachment C, E

01 ☒ F. CONTAMINATION OF SOIL
03 AREA POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☒ POTENTIAL ☐ ALLEGED

Soil contamination may have occurred as a result of poor housekeeping and operational practices which are common at Hummel Chemical facilities. Also, since dioxin type compounds, similar to those produced by the company, do not readily biodegrade or migrate through soil, it is likely any of these substances disposed by the company are still present.

Attachment A, C, E

01 ☐ G. DRINKING WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☐ POTENTIAL ☐ ALLEGED

There are no drinking water sources in the area, therefore no potential exists.

01 ☒ H. WORKER EXPOSURE/INJURY
03 WORKERS POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☒ POTENTIAL ☐ ALLEGED

Because Hummel was known to have mixed powdered chemicals in a manner which allowed the chemicals to spread throughout their process building, it is likely employees of the current occupant may come into contact with these chemicals if the building was not completely decontaminated.

Attachment C

01 ☒ I. POPULATION EXPOSURE/INJURY
03 POPULATION POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☒ POTENTIAL ☐ ALLEGED

Private citizens could be exposed to hazardous substances which were improperly disposed by the company. Citizens could come into contact with the substances as dust particles or aerosols which were blown off site. A large residential area lies only .5 miles west of the site.

Attachment A, C



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

1. IDENTIFICATION
01 STATE 02 SITE NUMBER
NJ D002174712

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☒ DAMAGE TO FLORA 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Flora may be impacted by hazardous substances disposed by the company, especially dioxin type compounds which may accumulate in plant tissues.

Attachment A pp. 33-34

01 ☒ DAMAGE TO FAUNA 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Fauna may be impacted by hazardous substances disposed by the company, especially dioxin type compounds which may accumulate in animal tissues.

Attachment A pp 25-33

01 ☒ CONTAMINATION OF FOOD CHAIN 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Hazardous substances disposed by the company, especially dioxin type compounds which bioaccumulate in animal tissues, may biomagnify through the trophic levels of the food chain. This is of great concern in this area because of the proximity to the Hackensack Meadowlands.

Attachment A pp. 25-34

01 ☒ UNSTABLE CONTAINMENT OF WASTES 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

Attachment C, E

Little is known about storage/disposal methods used by Hummel at the Newark facility. However because of the poor housekeeping and operational practices observed at the company's South Plainfield facility, it is likely similar conditions existed in Newark.

01 ☒ DAMAGE TO OFFSITE PROPERTY 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Adjacent properties may be damaged by improperly disposed hazardous substances.

01 ☒ CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Attachment D

Hummel is known to have disposed hazardous substances through floor drains at their South Plainfield facility. It is likely hazardous substances were also disposed of in this manner as well as through storm drains at the Newark site. Floor drains lead to the local sewage authority and storm drains discharge to the Passaic River.

01 ☒ ILLEGAL UNAUTHORIZED DUMPING 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

It is unknown what type of disposal was used at the site by Hummel. However, because of the lack of environmental concern shown by Hummel at its South Plainfield location, it is likely illegal/unauthorized dumping has occurred at the Newark site.

Attachment C,D,E

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED: _____

IV. COMMENTS

This company is not related to the Hummel-Lamolin Corp. which is located in the same complex.

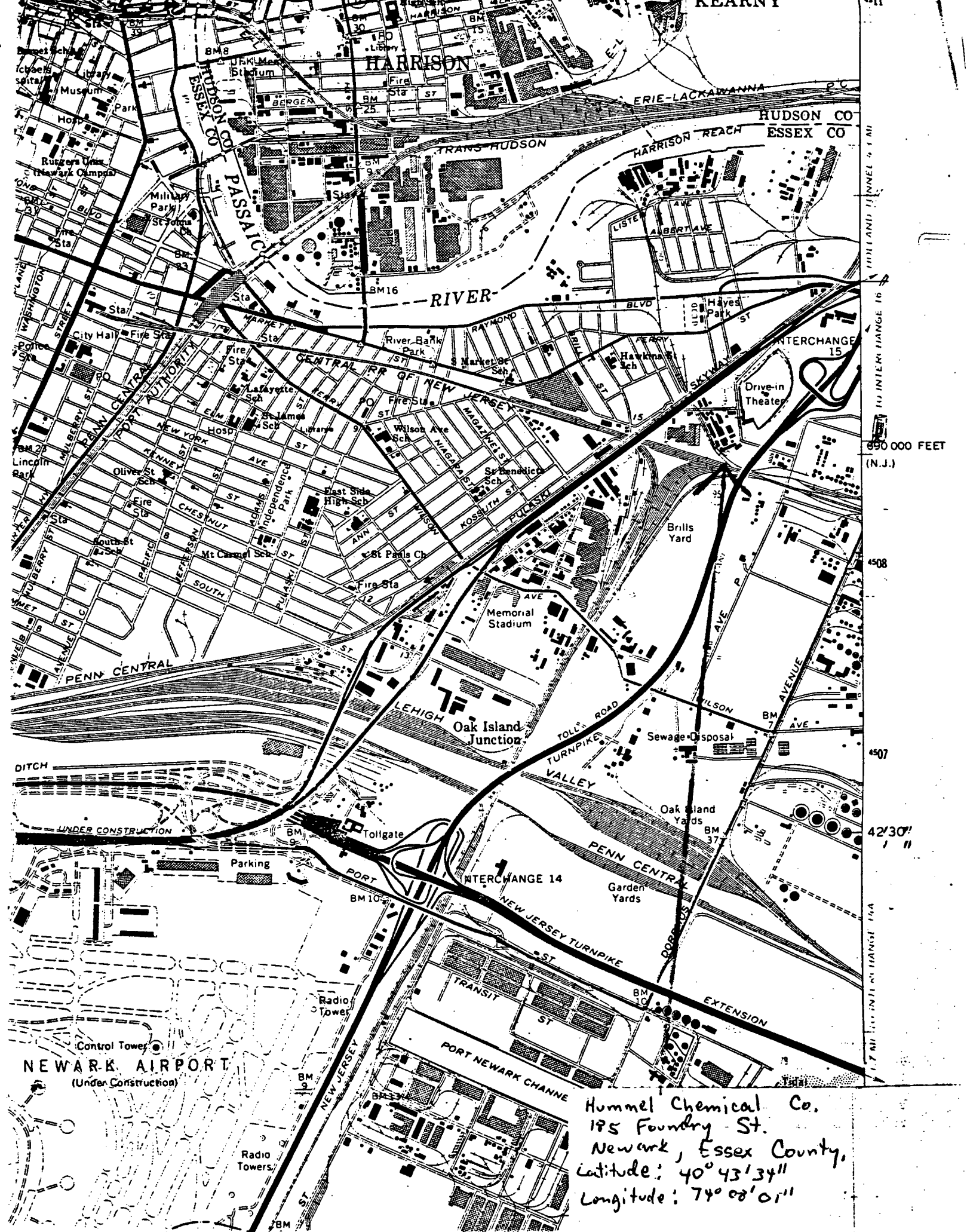
V. SOURCES OF INFORMATION

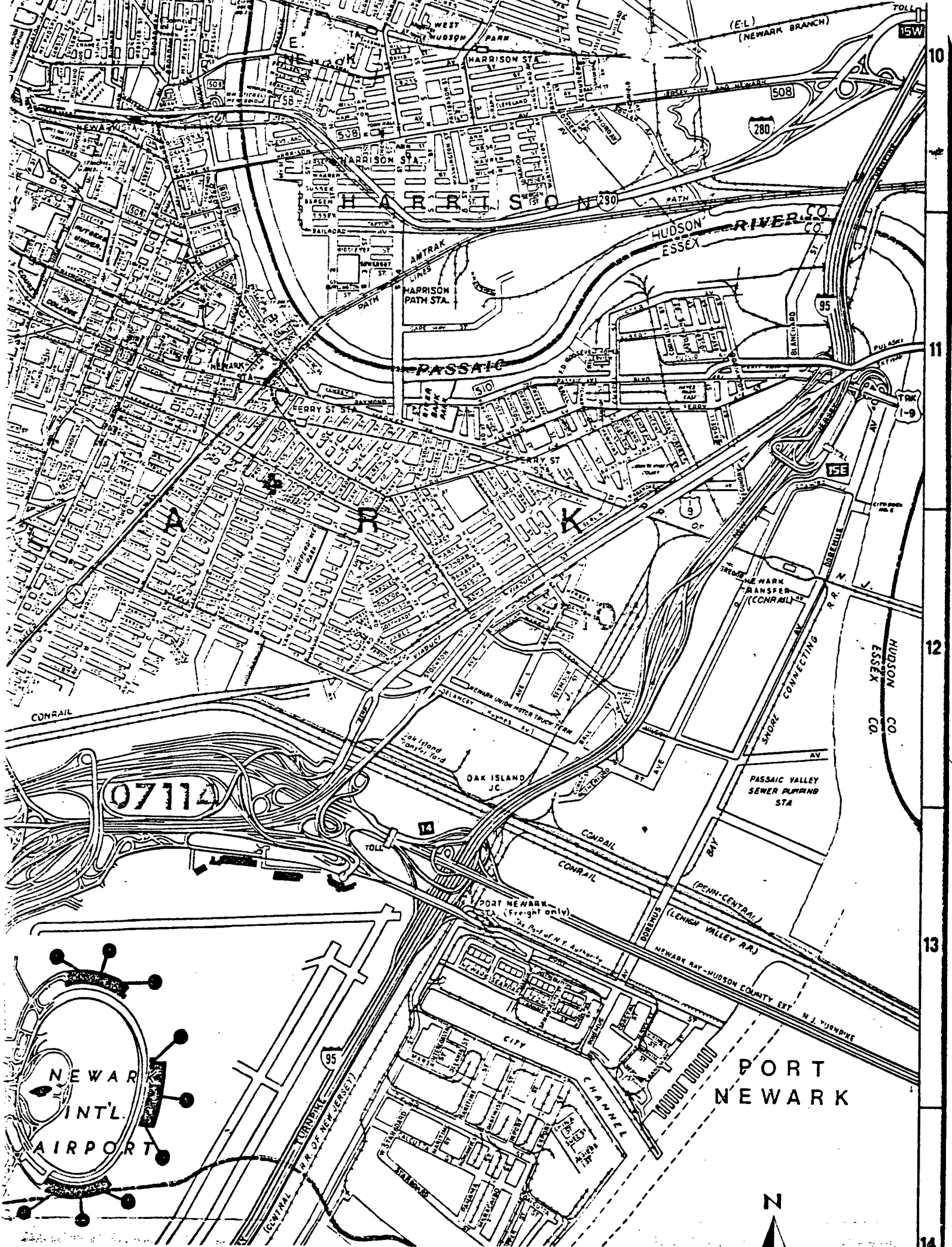
Attachment A - EPA publication - "DIOXINS" - EPA-600/2-80-197

Attachment B - Memos to File

Attachment C,D,E - NJDEP/Hazardous Waste Management/Bureau of Planning and Assessment

Attachment F - Groundwater Survey of Essex County



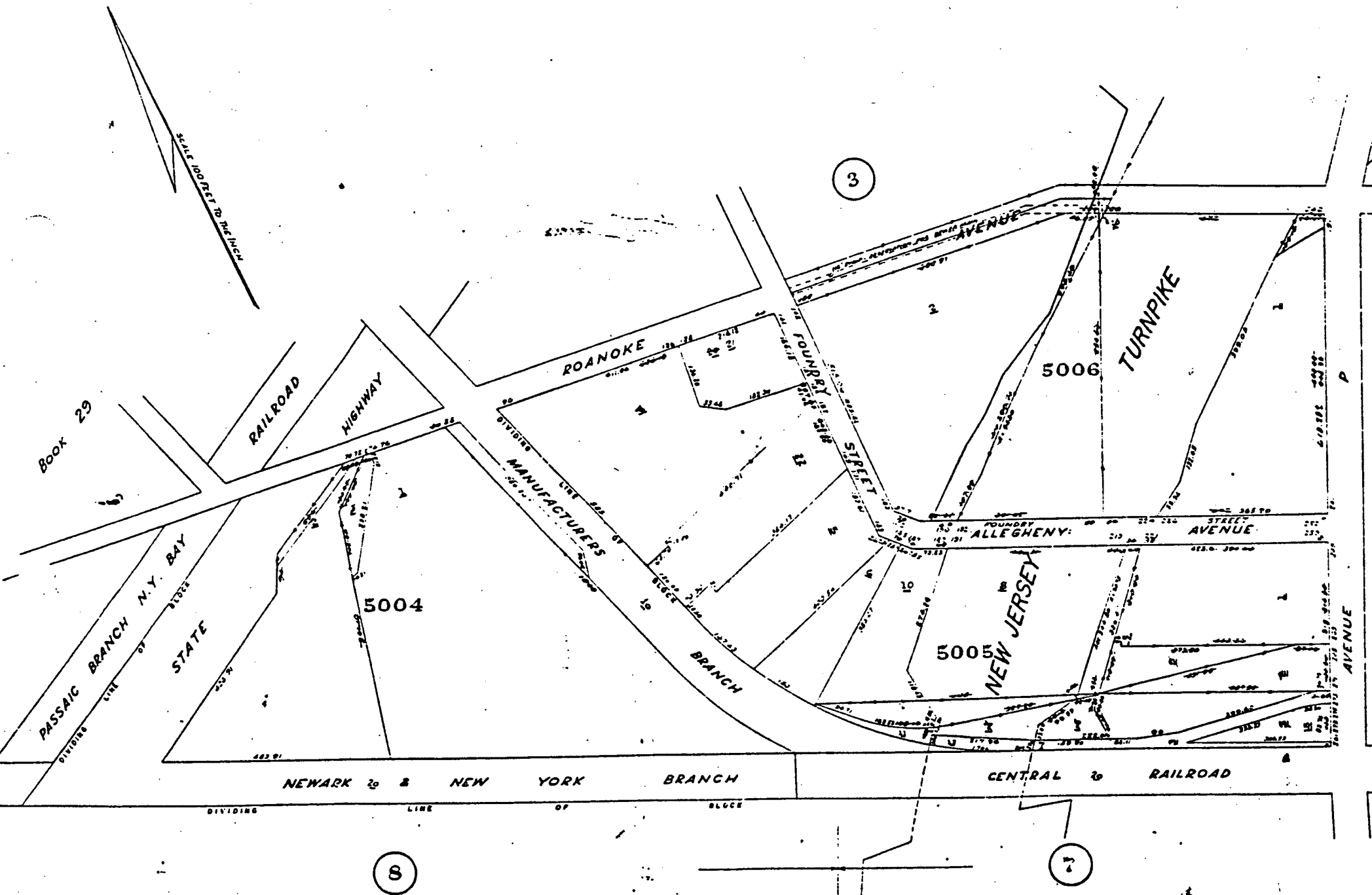


07114

NEWARK
INTL.
AIRPORT

PORT
NEWARK





EPA-600/2-80-197
November 1980

DIOXINS

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Contract Nos. 68-03-2577
68-03-2659
68-03-2579

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U.S. ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

A-Z

Florida. A.F. Armament Lab. AFATL-TR-

6-Tetrachlorodibenzo-*p*-Dioxin (TCDD)
J Decontamination Recommendations

7. Environmental Fate, and Human Risk
ated Dioxin. USAF, OEHL Technical

8. Accidental Contamination by TCDD:
el Lavoro, 67(5):371-378.

9. Chlor auf Phenole. Ber., 27:550.

10. Clinical Chemistry Effects of 2,3,7,8-
Laboratory Animals. Environmental Health

11. 1972. Contamination of the Bay of
chlorinated Biphenyls, Polychlorinated
dioxins, and Dibenzofurans. Environ-

APPENDIX A

The tables that follow list organic chemicals and pesticides selected for study on the basis of potential dioxin contamination, with known producers and production locations, present and past. The primary source of producer information is the Stanford Research Institute Directory of Chemical Producers. The tabulations are by chemical, with producers and locations; and by producer and location, with chemicals. The tabulations by chemical (Tables A1, A2, A3, and A6) are segregated according to the classifications based on dioxin concern as defined in Section 3. The classification information is also noted in the producer location tables by means of Roman numerals following the chemical names.

The tabulations by producer and location (Tables A4 and A7) group all of the critical chemicals involved at each manufacturer location. These lists do not necessarily define the site subject to exposure, because many dumps are remote from the plants; they do provide a starting point for such definition. Abandoned production of a chemical or abandoned facilities may present special problems. Therefore, the production facilities noted since 1968 but no longer active in 1978 are footnoted and are also extracted in separate tables (Tables A5 and A8). Some of these sites remain active in other production, and some may retain production capability and/or minor production of the subject chemical. Other plant sites may be totally deactivated or abandoned. The producer listed is the last known operator.

Some of the company names of producers designate subsidiary or divisional names, with notation of the parent company. Company addresses, from the Stanford Research Institute Directory and from the Thomas Register, are for the last known producer at a given location and are subject to the uncertainties introduced by acquisitions and name changes.

CLASS III ORGANIC CHEMICALS

Producer	Location
d	Buffalo, NY*
za	Ashland, MA
River Chem.	Toms River, NJ
za	Ashland, MA
Color and Chem.	Lock Haven, PA
aniline	Lock Haven, PA*
nt	Deepwater, NJ
anto	St. Louis, MO*
ton and Knowles	Fair Lawn, NJ
he	Kalama, WA*
a Chem.	Clifton, NJ*
e Chem.	Kalama, WA
r	Eddystone, PA
r	Los Angeles, CA*
	Edison, NJ*
	Nixon, NJ*
	Fords, NJ*
	Garfield, NJ
	East Rutherford, NJ
	Chattanooga, TN*
	Midland, MI
	St. Louis, MI*
	Rochester, NY
	Rochester, NY
	Rochester, NY
	Rochester, NY
	Deepwater, NJ*
	St. Bernard, OH*
	St. Bernard, OH*
Williams	San Diego, CA*
	Rochester, NY
ce	Bound Brook, NJ
ecticide	Edison, NJ*
rietta	Metuchen, NJ*
	Deepwater, NJ
	Sodyeco, NC*
	Luling, LA
	Sauget, IL*

TABLE A3. (continued)

Chemical	Producer	Location
<i>o</i> -Dichlorobenzene	Allied Chem. Products Dover Dow du Pont Hooker Monsanto Montrose Chem. Neville Chem. Olin PPG Solvent Chem.	Syracuse, NY* Cartersville, GA* Dover, OH* Midland, MI Deepwater, NJ* Niagara Falls, NY* Sauget, IL Henderson, NV Santa Fe Springs, CA* McIntosh, AL* Natrium, WV Niagara Falls, NY Malden, MA* Irwindale, CA Delaware City, DE Kearny, NJ
3,4-Dichlorobenzaldehyde	Tenneco	Fords, NJ
3,4-Dichlorobenzotrithloride	Tenneco	Fords, NJ
3,4-Dichlorobenzotrifluoride	Tenneco	Fords, NJ*
1,2-Dichloro-4-nitrobenzene	Blue Spruce Chem. Insecticide Martin Marietta Monsanto Plastifax	Bound Brook, NJ Edison, NJ* Metuchen, NJ* Sodyeco, NC* Sauget, IL* Gulfport, MS
3,4-Dichlorophenylisocyanate	Mobay Chem. Ott Chem.	New Martinsville, SC Muskegon, MI*
3,4-Difluoroaniline	Olin	Rochester, NY
<i>o</i> -Difluorobenzene	Olin	Rochester, NY
1,2-Dihydroxybenzene-3,5-disulfonic acid, disodium salt	Sterling Drug	New York, NY*
2,5-Dihydroxybenzenesulfonic acid	Eastman Kodak Nease Chem.	Rochester, NY* State College, PA*
2,5-Dihydroxybenzenesulfonic acid, potassium salt	Nease Chem.	State College, PA*
2,4-Dinitrophenol	Martin Marietta Mobay	Sodyeco, NC Bushy Park, SC
2,4-Dinitrophenoxyethanol	Hummel Chem.	Newark, NJ* South Plainfield, NJ

(continued)

TABLE A3. (continued)

Chemical	Producer	Location
3,5-Dinitrosalicylic acid	Eastman Kodak Hummel Chem.	Rochester, NY Newark, NJ*
	Salsbury Labs	South Plainfield, NJ* Charles City, IA
Fumaric acid	Allied	Buffalo, NY*
	Alberta Gas Hooker Monsanto** Petro-Tex Pfizer Reichhold Stepan Chem. Tenneco U.S. Steel	Moundsville, WV* Duluth, MN Arecibo, PR St. Louis, MO Houston, TX* Terre Haute, IN Morris, IL* Fieldsboro, NJ* Garfield, NJ Neville Island, PA
Hexabromobenzene	Velsicol Dover	St. Louis, MI Dover, OH*
Hexachlorobenzene	Hummel Chem. Stauffer	Newark, NJ* South Plainfield, NJ* Louisville, KY*
Hexafluorobenzene	PCR Whittaker	Gainesville, FL San Diego, CA* Louisville, KY*
Maleic acid	Allied	Buffalo, NY*
	Eastman Kodak Pfanstiehl Labs	Marcus Hook, PA Moundsville, WV* Rochester, NY* Waukegan, IL
Maleic anhydride	Allied Amoco Asland Chevron Koppers	Moundsville, WV* Joliet, IL Neal, WV Richmond, CA* Bridgeville, PA Cicero, IL
	Petro-Tex Monsanto Reichhold	Houston, TX* St. Louis, MO Elizabeth, NJ Morris, IL
	Standard Oil of Indiana (see Amoco above) Tenneco U.S. Steel	Fords, NJ Neville Island, PA
<i>o</i> -Nitroanisole	du Pont Monsanto	Deepwater, NJ Sauget, IL* St. Louis, MO

(continued)

TABLE A3. (continued)

Chemical
2-Nitro- <i>p</i> -cresol
<i>o</i> -Nitrophenol
Pentabromochlorocyclohexane
Pentabromoethylebenzene
Pentabromotoluene
Pentachloroaniline
Pentafluoroaniline
<i>o</i> -Phenetidine
Phenol (from chlorobenzene)
1-Phenol-2-sulfuric acid, formaldehyde condensate
Phenyl ether
Phthalic anhydride

(continued)

TABLE A4. (continued)

Producer	Location	Chemical (class)
Fairmount Chem. Co., Inc. 117 Blanchard St. Newark, NJ 07105	Newark, NJ	2-Chloro-1,4-diethoxy-5-nitrobenzene (II)
Fritzsche Dodge and Olcott, Inc. 76 Ninth Av. New York, NY 10011	Clifton, NJ	Benzaldehyde (III)* Phenyl ether (III)*
GAF Corp. 140 West 51st St. New York, NY 10020	Rensselaer, NY	2-Chloro-1,4-diethoxy-5-nitrobenzene (II) 5-Chloro-2,4-dimethoxy-aniline (II) 4-Chlororesorcinol (II)
W. R. Grace and Co. 7 Hanover Square New York, NY 10005	Fords, NJ	Phthalic anhydride (III)*
Great Lakes Chem. Corp. Hwy. 52, Northwest West Lafayette, IN 47906	El Dorado, AR	Decabromophenoxybenzene (I) Tetrabromobisphenol-A (II)
Guardian Chem. Corp. 230 Marcus Blvd. Hauppauge, NY 11787	Hauppauge, NY	Chlorohydroquinone (II)* 2,4,6-Tribromophenol (I)
Hexcel Corp. 11711 Dublin Blvd. Dublin, CA 94566	Sayerville, NJ	Pentabromoethylbenzene (III)
Hooker Chem. Corp. 1900 St. James Place Houston, TX 77027 Subsid. Occidental Petroleum Corp.	Arecibo, PR Niagara Falls, NY	Fumaric acid (III) Phthalic anhydride (III) o-Dichlorobenzene (III)* Tetrachlorophthalic anhydride (III)* 1,2,4,5-Tetrachlorobenzene (III)* 1,2,4-Trichlorobenzene (III)* Phenol (III)*, ** Phenol (III)*, **
Hummel Chem. Co., Inc. P.O. Box 250 South Plainfield, NJ 07080	Newark, NJ South Plainfield, NJ	2,4-Dinitrophenoxyethanol (III)* 3,5-Dinitrosalicylic acid (III)* Hexachlorobenzene (III)* Picric acid (III)* 2,4-Dinitrophenoxyethanol (III) 3,5-Dinitrosalicylic acid (III)* Hexachlorobenzene (III)* Picric acid (III)* Sodium picrate (III)

(continued)

TABLE A4. (continued)

Producer	Location
ICC Industries See Solvent Chem.	
Inmont Corp. 1133 Av. of the Americas New York, NY 10036 Subsid. of Carrier Corp.	Carl NOT list ica acc Inn
International Mineral and Chem. Corp. IMC Plaza Libertyville, IL 60048	Nev
Kalama Chemc, Inc. The Bank of California Center Suite 1110 Kalama, WA	Kal.
Kopper Co., Inc. Koppers Bldg. Pittsburgh, PA 15219	Bric Chi Cic
Martin Marietta Corp. 6801 Rockledge Dr. Bethesda, MD 20034	Soc
Maumee Chem. Co. Presumed to be acquired by Sherwin Williams Address not available	St.
Mobay Chem. Co. Penn Lincoln Pkwy. West Pittsburgh, PA 15205	Ne
Monroe Chem. Co. Saville Av. at 4th St. Eddystone, PA Subsid. of Kalama Chem., Inc. (see Kalama) (continued)	Ed

ORGANIC CHEMICAL PRODUCTION

Chemical (class)

2,4-Dichlorophenol (I)

3-Amino-5-chloro-2-hydroxy-benzenesulfonic acid (III)

Fumaric acid (III)

Maleic acid (III)

1-Phenol-2-sulfonic acid, formaldehyde condensate (III)

Phthalic anhydride (III)

Phthalic anhydride (III)

Phthalic anhydride (III)

Phthalic anhydride (III)

Fumaric acid (III)

Maleic acid (III)

Maleic anhydride (III)

o-Dichlorobenzene (III)

o-Anisidine (III)

3,4-Dichloroaniline (III)

1,2-Dichloro-4-nitrobenzene (III)

3,4-Dichloroaniline (III)

1,2-Dichloro-4-nitrobenzene (III)

o-Dichlorobenzene (III)

Maleic anhydride (III)

Phthalic anhydride (III)

1,2,4-Trichlorobenzene (III)

Phthalic anhydride (III)

Phthalic anhydride (III)

o-Dichlorobenzene (III)

Hexachlorobenzene (III)

1,2,4,5-Tetrachlorobenzene (III)

Tetrachlorobisphenol-A (II)

Tetrachlorobisphenol-A (II)

1,2,4-Trichlorobenzene (III)

1-Phenol-2-sulfonic acid, formaldehyde condensate (III)

Phenol (III)*

2,4,6-Tribromophenol (I)

Benzaldehyde (III)

TABLE A5. (continued)

Producer	Location	Chemical (class)
du Pont	Deepwater, NJ	4-Chloro-2-nitrophenol (III) <i>o</i> -Dichlorobenzene (III) 2-Nitro- <i>p</i> -cresol (III) <i>o</i> -Nitrophenol (III)
Eastern Chem. (Currently Eastern Chem. Div. of Guardian)	Pequannock, NJ	Chlorohydroquinone (II) 2,4,6-Tribromophenol (I)
Eastman Kodak	Rochester, NY	2,5-Dihydroxybenzenesulfonic acid (III) Maleic acid (III)
Fritzsche	Clifton, NJ	Benzaldehyde (III) Phenyl ether (III)
W. R. Grace	Fords, NJ	Phthalic anhydride (III)
Guardian	Hauppauge, NY Pequannock, NJ	Chlorohydroquinone (II) Chlorohydroquinone (II) 2,4,6-Tribromophenol (I)
Hooker	Niagara Falls, NY	<i>o</i> -Dichlorobenzene (III) Tetrachlorophthalic anhydride (III) 1,2,4,5-Tetrachlorobenzene (III) 1,2,4-Trichlorobenzene (III) Phenol (III)* Phenol (III)*
Hummel Chem.	North Tonawanda, NY South Shore, KY	
	Newark, NJ	2,4-Dinitrophenoxyethanol (III) 3,5-Dinitrosalicylic acid (III) Hexachlorobenzene (III) Picric acid (III) 3,5-Dinitrosalicylic acid (III) Hexachlorobenzene (III) Picric acid (III)
	South Plainfield, NJ	
Inmont (formerly Interchemical Corp.)	Carlstadt, NJ	3,5-Dichlorosalicylic acid (III)
Koppers	Chicago, IL Cicero, IL	Phthalic anhydride (III) Maleic anhydride (III)
Martin Marietta	Sodyeco, NC	2,6-Dibromo-4-nitrophenol (II) 3,4-Dichloroaniline (III) 1,2-Dichloro-4-nitrobenzene (III) Sodium picrate (III)

(continued)

SECTION 7

ENVIRONMENTAL DEGRADATION

AND TRANSPORT

This section addresses the fate of dioxins once they are released to the environment. Subsections on biodegradation and photodegradation deal with recent literature relating to biochemical and physical actions of the environment as they affect the integrity of the dioxin structure. Subsections on physical and biological transport deal with the movement of dioxins in soil, water, and air and with the uptake of dioxins by plants and their fate in animals at various trophic levels.

BIODEGRADATION

In assessment of the persistence of a substance in the environment, the susceptibility of that substance to biodegradation* is a primary concern. Several studies on the biodegradability** of dioxins are described in the literature. The investigations show that dioxins exhibit relatively strong resistance to biodegradation, though they may not necessarily be totally recalcitrant. Most of the work has focused on 2,3,7,8-TCDD because of its extreme toxicity. This dioxin has been studied in both aqueous and soil environments, and results have been somewhat equivocal. Only one study (Kearney et al. 1973) has examined the biodegradability of another dioxin, 2,7-DCDD. Data from this study indicate that this dioxin can be at least partially degraded in soils. Several dioxin biodegradation studies are described in the following paragraphs, but due to recent information concerning problems of extracting dioxins from the test soils, it must now be concluded that the biodegradability of dioxins has not been demonstrated.

Approximately 100 strains of microbes that had previously shown the ability to degrade persistent pesticides were tested for their ability to degrade 2,3,7,8-TCDD. After incubation, extracts from microorganisms were prepared and analyzed for metabolites by thin-layer chromatography. Of the strains tested, five showed some ability to degrade the dioxin.

Some studies, as described in the next three paragraphs and other places within this compilation, have been conducted with ^{14}C -labeled 2,3,7,8-TCDD. Dow Chemical Company points out that ^{14}C -labeled experiments are limit-producing only and are not quantitative in spite of some data being reported to two significant figures (Crummett 1980).

Ward and Matsumura studied the biodegradation of ^{14}C -labeled 2,3,7,8-TCDD in Wisconsin lake waters and sediments and reported in 1977 that the dioxin may be genuinely metabolized in aqueous systems, but that the rate is very low. They concluded that there is an optimum time for microbial degradation, probably 1 month, and that during this period, available 2,3,7,8-TCDD is degraded while the nonavailable fraction is bound to the water sediments. The limited degradation of

- **Biodegradation:** the molecular degradation of an organic substance resulting from the complex actions of living organisms. A substance is said to be biodegraded to an environmentally acceptable extent when environmentally undesirable properties are lost. Loss of some characteristic function or property of a substance by biodegradation may be referred to as biological transformation. (CEFIC 1978)
- **Biodegradability:** the ability of an organism to

****Biodegradability:** the ability of an organic substance to undergo biodegradation.

2,3,7,8-TCDD is favored by the organic matter in the aqueous phase. The sediment-containing lake waters and sediment was longer.

Kearney and co-workers studied 2,3,7,8-TCDD at concentrations of 0.7, 1.4, and 7.0 ppm. The soil samples were monitored relatively high in organic matter which is low in organic matter and the soil samples were monitored for indication of microbial degradation. CO₂ was liberated

Very little CO_2 was liberated from 2,3,7,8-TCDD. In most cases 7% or less of the CO_2 evolved from both soil types up to 160 days after treatment of soil after 1 year. About 10% of the CO_2 evolved from the treated soil after 10 weeks. C-14 had a slight effect on CO_2 evolution. Liberation at the highest level of isomer was the highest. The isomer was higher in the Lakeland soil than in the Lakeland soil. The soil extracts also revealed the isomer could not be identified.

In the same study, incubation to which ^{14}C -2,3,7,8-TCDD in amount of $^{14}\text{CO}_2$ after 2 weeks

The U.S. Air Force studied the soil degradation rate of 2,3,7,8-TCDF (1976). The three test plots were under different environmental conditions and soil types. Herbicide was applied to all three plots at a rate of 100 g/m². The concentrations of the dioxin were not reported. The degradation in the upper 15 cm of each soil were determined by soil extraction, application, and analyzed for 2,3,7,8-TCDF. The results are presented in Table 47.

From these data and other disappearance of 2,3,7,8-TC microbes, because dioxin leaching was insignificant, degradation was most rapid in Florida soil (Lakeland sandy) but that variations in soil persistence. It was also reported decreased substantially over investigators speculated that metabolism and possibly di-

In an evaluation of the A different conclusions. After concentrations in soil again concluded: (1) that there was time; and (2) that degradation the Kansas soil (opposite o

In another Air Force study and mixing on 2,3,7,8-TCDF (Morgan 1975). Pots cont:

DEGRADATION PORT

as once they are released to the and photodegradation deal with physical actions of the environment as pure. Subsections on physical and of dioxins in soil, water, and air and or fate in animals at various trophic

ATION

substance in the environment, the tion* is a primary concern. Several are described in the literature. The relatively strong resistance to arily be totally recalcitrant. Most of e of its extreme toxicity. This dioxin environments, and results have been ney et al. 1973) has examined the D. Data from this study indicate that egraded in soils. Several dioxin following paragraphs, but due to recent g dioxins from the test soils, it must dioxins has not been demonstrated. t had previously shown the ability to eir ability to degrade 2,3,7,8-TCDD. sms were prepared and analyzed for f the strains tested, five showed some

e paragraphs and other places within h ^{14}C -labeled 2,3,7,8-TCDD. Dow led experiments are limit-producing data being reported to two significant

idation of ^{14}C -labeled 2,3,7,8-TCDD reported in 1977 that the dioxin may s, but that the rate is very low. They r microbial degradation, probably l 2,3,7,8-TCDD is degraded while the ediments. The limited degradation of

ne substance resulting from the complex actions ed to an environmentally acceptable extent when of some characteristic function or property of a ological transformation. (CEFIC 1978) o undergo biodegradation.

2,3,7,8-TCDD is favored by the presence of sediment, microbial activity, and or organic matter in the aqueous phase. The observed half-life of 2,3,7,8-TCDD in sediment-containing lake waters was 550 to 590 days; the half life in waters without sediment was longer.

Kearney and co-workers studied two types of soil, which were incubated with 2,3,7,8-TCDD at concentrations of 1, 10, and 100 ppm and with ^{14}C -labeled 2,3,7,8-TCDD at concentrations of 1.78, 3.56, and 17.8 ppm (Kearney et al. 1973a). The two soils were also inoculated with ^{14}C -labeled 2,7-DCDD at concentrations of 0.7, 1.4, and 7.0 ppm. The soil types were Hagerstown silt clay loam, which is relatively high in organic matter and microbial activity, and Lakeland sandy loam, which is low in organic matter and microbial activity. Over a 9- to 10-month period, the soil samples were monitored weekly for evolution of gaseous $^{14}\text{CO}_2$ as an indication of microbial degradation of the labeled dioxins.

Very little CO_2 was liberated from soils containing either labeled or unlabeled 2,3,7,8-TCDD. In most cases 75 to 85 percent of the dioxin was recovered from both soil types up to 160 days after addition. No metabolites were found in TCDD-treated soil after 1 year. About 5 percent of the ^{14}C -2,7-DCDD had degraded to liberate $^{14}\text{CO}_2$ after 10 weeks. Concentrations of ^{14}C -2,7-DCDD in the soil had a slight effect on $^{14}\text{CO}_2$ evolution. It was postulated that the decrease in CO_2 liberation at the highest level may have resulted from the toxicity of the DCDD isomer to the microbes at this concentration. Evolution of $^{14}\text{CO}_2$ was significantly higher in the Lakeland soil than in the Hagerstown soil. Analysis of DCDD-treated soil extracts also revealed the presence of metabolites, but the major metabolite could not be identified.

In the same study, incubation of a clay loam (with relatively low organic matter) to which ^{14}C -2,3,7,8-TCDD had been applied led to liberation of a "very small amount of $^{14}\text{CO}_2$ " after 2 weeks.

The U.S. Air Force studied test plots in Utah, Kansas, and Florida to determine the soil degradation rate of 2,3,7,8-TCDD under field conditions (Young et al. 1976). The three test plots were considered representative of various climatic conditions and soil types. Herbicide Orange containing 3700 ppb 2,3,7,8-TCDD was applied to all three plots at a rate of 4480 kg/hectare. Initial soil concentrations of the dioxin were not reported for any of the sites. Composite samples from the upper 15 cm of each soil were taken from time to time after the initial herbicide application, and analyzed for both the herbicide and 2,3,7,8-TCDD. Results are presented in Table 47.

From these data and other leaching data, the Air Force concluded that the disappearance of 2,3,7,8-TCDD was most likely due to degradation by soil microbes, because dioxin concentrations in the 15- to 30-cm layer indicated that leaching was insignificant. The Air Force report further stated that dioxin degradation was most rapid in the Kansas soil (Ulysses silt loam), followed by the Florida soil (Lakeland sandy loam), and finally the Utah soil (Lacustine clay loam), but that variations in soil and climate had little overall influence on dioxin persistence. It was also reported that the initial breakdown rate was rapid, but decreased substantially over the test period. On the basis of this observation the investigators speculated that microbial enzymes responsible for herbicide metabolism and possibly dioxin metabolism are inducible.

In an evaluation of the Air Force studies, Commoner and Scott (1976) came to different conclusions. After constructing semilogarithmic plots of dioxin concentrations in soil against days after incorporation of the dioxin, they concluded: (1) that there was no evidence that the rate of degradation changed with time; and (2) that degradation appeared to be more rapid in the Florida soil than in the Kansas soil (opposite of the Air Force conclusion).

In another Air Force study with dioxin-contaminated soil the effects of nutrients and mixing on 2,3,7,8-TCDD degradation were assessed (Bartleson, Harrison, and Morgan 1975). Pots containing either test soils or control soils were placed

TABLE 47. CONCENTRATIONS OF HERBICIDE ORANGE AND 2,3,7,8-TCDD IN THREE TREATED TEST PLOTS^a

Test plot	Days after application	Total herbicide ^b (ppm)	2,3,7,8-TCDD (ppb)
Utah	282	8490	15.0
	637	4000	7.3
	780	2260	5.6
	1000	2370	3.2
	1150	960	2.5
Kansas	8	1950	c
	77	1070	0.255
	189	490	c
	362	210	c
	600	40	c
	659	<1	0.042
Florida	5	4897	0.375
	414	1866	0.250
	513	824	0.075
	707	508	0.046
	834	438	c
	1293	<10	c

a—Plots treated with 4480 kg herbicide per hectare.

b—Composite sample from upper 0 to 15 cm layer of soil.

c—Not analyzed

outdoors and in a greenhouse. The soils were analyzed after 9 and 23 weeks. Soils tested in the greenhouse were moistened with a nutrient solution. The results are presented in Table 48.

The investigators concluded that the accelerated rate of degradation observed in soil from the pots in the greenhouse during the first 9-week period was probably due to increased microbial populations resulting from initial soil aeration and increased soil temperatures in the pots. Reduction in the rate of breakdown after 9 weeks may have been caused by leaching or entrapment of dioxin in the bottom soil layer, which had not been mixed. It was also proposed, however, that the nutrient solution together with light or aeration caused either a direct chemical breakdown of 2,3,7,8-TCDD in the soil or an increase in microbial populations that accelerated breakdown. Because green algae were observed on the surface of the greenhouse pots between tillings, it was also postulated that the algae were partly responsible for the degradation.

This study was also evaluated by Commoner and Scott (1976), who concluded that mixing, nutrients, and increased exposure to sunlight did not significantly enhance degradation of 2,3,7,8-TCDD in soil.

Pocchiari (1978) attempted to stimulate the microbial degradation of 2,3,7,8-TCDD in samples of Seveso soil contaminated with the dioxin from the 1976 ICMSA accident. The dioxin-contaminated soil samples were either inoculated with promising microorganisms (according to the previously described results of Matsumura and Benzeet in 1973) or enriched by the addition of organic nutrients. No positive degradation effects have been found.

TABLE 48. DEGRADATION OF 2,3,7,8-TCDD IN THREE TREATED TEST PLOTS^a

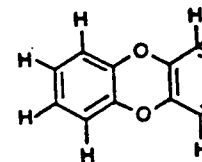
Test plot	Days after application	2,3,7,8-TCDD (ppb)
Controls		1100
Outdoor exposure		
Tilled (top layer)		
Untilled		
Greenhouse		
Tilled (top layer)		
Untilled		

a—Source: Bartleson, Harrison, and

Investigators from the Micro found that microbes cannot decontaminate soil-bound slowly (Huetter 1980). The latter bands in thin-layer chromatography co-workers also have observed a prolonged period of time, it is soil, indicating that recoverability with time. This information raises others in the past to measure

Preliminary findings of studies TCDD may be slowly biodegraded matrix used for secondary tre pulping operations (Salkinoy)

Klecka and Gibson (1979) found dioxin can be readily metabolized by 9816 strain II) when an alternative. The dioxin molecule was 1,2-dihydrodibenzo[1,4]dioxin hydroxydibenzo[1,4]dioxin (finding no organisms capable



1

P)

Photodegradation is the process, also known as photo

HERBICIDE ORANGE AND
ATED TEST PLOTS^a

Total herbicide ^b (ppm)	2,3,7,8-TCDD (ppb)
8490	15.0
4000	7.3
2260	5.6
2370	3.2
960	2.5
1950	c
1070	0.255
490	c
210	c
40	c
<1	0.042
4897	0.375
1866	0.250
824	0.075
508	0.046
438	c
<10	c

TABLE 48. DEGRADATION OF 2,3,7,8-TCDD IN SOIL^a
(parts per trillion 2,3,7,8-TCDD)

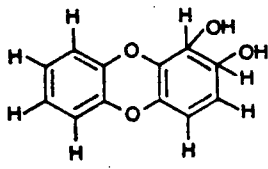
	Length of exposure (weeks)		
	0	9	23
Controls	1100-1300		
Outdoor exposure			
Tilled (top layer)		1100	520
Untilled		1000	530
Greenhouse			
Tilled (top layer)		640	460
Untilled		810	530

a—Source: Bartleson, Harrison, and Morgan 1975.

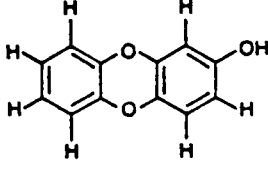
Investigators from the Microbiological Institute in Zurich, Switzerland, have found that microbes cannot contribute quickly or efficiently to the decontamination of soil-bound 2,3,7,8-TCDD, although they might contribute slowly (Huetter 1980). The latter point is supported by the observation of two polar bands in thin-layer chromatographs of some microbial incubations. Huetter and co-workers also have observed that when 2,3,7,8-TCDD is incubated with soil for a prolonged period of time, it is not as extractable as when it is freshly added to the soil, indicating that recoverability of the dioxin becomes increasingly more difficult with time. This information raises questions about the accuracy of work done by others in the past to measure the soil half-life of 2,3,7,8-TCDD.

Preliminary findings of studies under way in Finland indicate that 2,3,7,8-TCDD may be slowly biodegraded by anaerobic microorganisms in an organic matrix used for secondary treatment of chlorophenolic wastewaters from paper-pulping operations (Salkinoya-Salonen 1979).

Klecka and Gibson (1979) have recently reported that unsubstituted dibenzo-*p*-dioxin can be readily metabolized by a mutant strain of *Pseudomonas* (sp. N.C.I.B. 9816 strain II) when an alternative source of carbon such as salicylate is available. The dioxin molecule was metabolized first to *cis*-1,2-dihydroxy-1,2-dihydrodibenzo[1,4]dioxan (I), which was subsequently dehydrated to yield 2-hydroxydibenzo[1,4]dioxan (II) as the major metabolite. The authors reported finding no organisms capable of utilizing dibenzo-*p*-dioxin as a sole carbon source.



I



II

PHOTODEGRADATION

Photodegradation is the process of breaking chemical bonds with light. The process, also known as photolysis, involves the breakdown of a chemical by light

A-11

energy, usually in a specific wavelength range. In photodegradation of dioxins, the ultraviolet wavelengths of light have been shown to be the most effective.

In most photolysis studies, scientists are interested in determining one or more of the following parameters:

1. Photolysis reaction rates
2. Photolysis reaction products
3. Wavelength(s) required for photolysis
4. Other specific conditions required for photolysis

The photolysis of chlorinated aromatic compounds usually involves loss of a chlorine molecule to a free radical, or loss through nucleophilic displacement if a solvent or substrate molecule is present. These mechanisms may be influenced by the presence of other reagents or the nature of the reaction medium.

Photolysis studies have clearly shown that dioxins may be photolytically degraded in the environment by natural sunlight. The extent to which this mechanism actually removes or degrades dioxins in the "real-world" environment is difficult to assess, but of all the possible natural removal mechanisms, photolysis appears to be the most significant. It should be noted that photolysis apparently results in the removal of one or more chlorine atoms from the dioxin molecule. Removal of chlorine from 2,3,7,8-TCDD may make it less toxic, but it has been speculated that the basic dioxin structure remains. When penta-CDD is photodegraded, it may go to a TCDD isomer. (For further discussion see pp. 263-264 of Section 8.)

Several dioxin photodegradation studies are discussed in the paragraphs that follow. Major findings from these studies are summarized in Tables 49 and 50.

Crosby et al. (1971) studied photolysis rates of 2,3,7,8-TCDD, 2,7-DCDD, and OCDD dissolved in methanol. Samples were irradiated with natural sunlight or artificial sunlight with a light intensity of 100 MW/cm² at the absorption maximum of 2,3,7,8-TCDD (307 nm). Irradiation of a single solution of 2,3,7,8-TCDD in methanol for 24 hours in natural sunlight resulted in complete photolysis to less-chlorinated dioxin isomers. The degradation of 2,7-DCDD was at least initially more rapid than that of 2,3,7,8-TCDD. After 6 hours of irradiation in artificial ultraviolet light, about 30 percent of the 2,7-DCDD remained unreacted whereas almost 50 percent of the 2,3,7,8-TCDD remained unreacted. The amount of 2,7-DCDD remaining after 24 hours was not reported. The OCDD was photolyzed much more slowly than the TCDD or DCDD isomers: after 24 hours, over 80 percent of the initial OCDD (2.2 mg/liter) remained unreacted. Analysis of reaction products indicated chlorinated dioxins of reduced chlorine content.

In another study the degradation of OCDD on filter paper was reported as being more rapid in natural sunlight than in artificial ultraviolet light (Arsenault 1976). Degradation of OCDD also proceeded more rapidly in the presence of mineral oil or a petroleum oil solvent than in the absence of oil. When OCDD in oil was exposed to natural sunlight, 66 percent was decomposed in as little as 16 hours. When exposed in the absence of oil, only 20 percent was decomposed within 16 hours. No TCDD's were found in the decomposition products.

The same report describes a study of the rate of OCDD degradation on the surfaces of wooden poles treated with PCP-petroleum and Cellon. Preliminary results show that the OCDD is rapidly degraded. Breakdown products are not reported.

In tests involving exposure of a crystalline water suspension of 2,3,7,8-TCDD to a sunlamp, the insolubility of the dioxin caused difficulties. Irradiation apparently had no effect on the water suspension. A crystalline state may prohibit the loss of chlorine or obstruction of hydrogen atoms from each other (Plimmer 1978a).

When a benzene solution of 2,3,7,8-TCDD was added to water stabilized with a surfactant and irradiated with a sunlamp, the dioxin content was reduced (Plimmer et al. 1973).

TABLE 49. PHOTODEGRADATION OF 2,3,7,8-TCDD

Physical conditions	Light source	Length of exposure	Amount degraded (%)	Reaction products	Reference
TCDD in methanol	Artificial (100 μ W/cm ²)	24 h	100	Trichlorodibenzo- <i>p</i> -dioxin Dichlorodibenzo- <i>p</i> -dioxin	Crosby et al. 1971
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TABLE 49. PHOTODEGRADATION OF 2,3,7,8-TCDD

Physical conditions	Light source	Length of exposure	Amount degraded (%)	Reaction products	Reference
TCDD in methanol	Artificial (100 μ w/cm ²)	24 h	100	Trichlorodibenzo- <i>p</i> -dioxin Dichlorobenzo- <i>p</i> -dioxin	Crosby et al. 1971
TCDD in methanol	Natural sunlight	7 h	100	NR ^a	Crosby et al. 1971
TCDD (crystalline) in water	Artificial (sunlamp)	NR	0	NA ^b	Crosby et al. 1973
TCDD on soil		96 h	0		
TCDD in benzene/water/ surfactant	Artificial (sunlamp)	NR	>0	NR	Plimmer et al. 1973
TCDD crystals on glass plate	Natural sunlight	14 days	0	NR	Crosby et al. 1971
TCDD in isooctane and 1-octanol	Artificial (G.E. RS sunlamp)	40 min 24 h	50 100	NR NR	Stehl et al. 1973 Stehl et al. 1973
TCDD in Herbicide Orange, on glass	Natural sunlight	6 h	60		Crosby and Wong 1977
TCDD in commercial Esteron herbicide, on glass	Natural sunlight	6 h	70	NR	Crosby and Wong 1977
TCDD in Esteron base, on glass	Natural sunlight	2 h	90		Crosby and Wong 1977

(continued)

TABLE 49. (continued)

Physical conditions	Light source	Length of exposure	Amount degraded (%)	Reaction products	Reference
TCDD in Herbicide Orange, on plant leaves	Sunlight	6 h	100		Crosby and Wong 1977
		6 h	70		
TCDD in Herbicide Orange, on soil	Sunlight	6 h	10		Crosby and Wong 1977
TCDD on silica gel	Artificial λ >290 nm	7 days	92	NR*	Gebefuigi 1977
TCDD on silica gel	Artificial λ = 230 nm	7 days	98	NR	Gebefuigi 1977
TCDD in Seveso soil with ethyl oleate-xylene mixture	Sunlight artificial (Phillips MLU 300 W)	7 days	>90	NR	Bertoni 1978
		3 days	100		
TCDD in 1-hexadecylpyridinium chloride (CPC)	Artificial	4 h	>90	NR	Botre et al. 1978
TCDD in sodium dodecylsulfate (SDS)	Artificial	4 h	~50	NR	Botre et al. 1978
		8 h	~100	NR	
TCDD in methanol	Artificial	4 h	~50	NR	Botre et al. 1978
		8 h	~75	NR	

(continued)

TCDD in sodium dodecylsulfate (SDS)	Artificial	4 h	=50	NR	Botre et al. 1978
		8 h	=100	NR	
TCDD in methanol	Artificial	4 h	=50	NR	Botre et al. 1978
		8 h	=75	NR	

(continued)

TABLE 49. (continued)

Physical conditions	Light source	Length of exposure	Amount degraded (%)	Reaction products	Reference
TCDD in Seveso soil/treated with aqueous olive oil solution or olive oil/cyclohexanone	Natural sunlight	9 days	>90	NR	Crosby 1978
TCDD in emulsifiable silvex formulation	Natural sunlight	=8 days	50	NR	Nash and Beall 1978
TCDD in granular silvex formulation	Natural sunlight	=13.5 days	50	NR ^a	Nash and Beall 1978

a--NR = Not reported.
b NA = Not applicable

A-15

TABLE 50. PHOTODEGRADATION OF DCDD AND OCDD

Physical conditions	Light source	Length of exposure	Amount degraded (%)	Reaction products	Reference
OCDD in methanol	Artificial UV light (100 $\mu\text{w}/\text{cm}^2$)	24 h	>20	Series of chlorinated dioxins of decreasing chlorine content	Crosby et al. 1971
OCDD on filter paper	Artificial sunlight Natural sunlight	NR ^a	More rapid in natural sunlight than artificial UV light	NR	Arsenault 1976
OCDD in oil (mineral or petroleum)	Natural sunlight	16 h	66	NR	Arsenault 1976
OCDD—no oil	Natural	16 h	20	NR	Arsenault 1976
OCDD/benzene-hexane	Mercury UV lamp	4 h	70	Hexa-CDD, hepta-CDD, penta-CDD	Buser 1976
OCDD/benzene-hexane	Mercury UV lamp	24 h	90	Hexa-CDD, hepta-CDD, penta-CDD, TCDD (trace)	Buser 1976
OCDD in isooctane	Artificial UV light	18 h	20	NR	Stehl et al. 1973
OCDD in 1-octanol	Artificial UV light	20 h	6	NR	Stehl et al. 1973
DCDD in methanol	Artificial UV light	~6 h	~70	NR	Crosby et al. 1971
DCDD in isooctane and 1-octanol	Artificial UV light	40 min	50	NR	Stehl et al. 1973

^a—NR = Not reported.

In another study, irradiation caused applying this sunlight (Buser (1976) 1 to 24 hours with of the OCDD, hepta-CDD's an hexa- and hepta significant amount of the some commercial hepta-CDD's, p have environment Exposure of sunlight (Genera of about 40 min after 24 hours o ppm. A bioassay applied revealed When a solution about 80 percent of OCDD and 1- 20 hours (Stehl In a series of TCDD were exposed (1977). After 6 h herbicide compounds 2,3,7,8-TCDD, percent of the herbicides, but v petri dishes. The after 2 hours. H leaves and to the to sunlight. At a detected on the however, about reported that up, the dioxin rema photolysis of 2,3 particles.

Investigators i photolysis:

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Crosby et al. 1971
Stehl et al. 1973

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Artificial UV light
Artificial UV light

DCDD in isooctane and
1-octanol

a-NR = Not reported

In another study when 2,3,7,8-TCDD was applied to dry or moist soil, irradiation caused no change after 96 hours. Similar results were obtained by applying this substance to a glass plate and irradiating up to 14 days (Crosby et al. 1971).

Buser (1976) irradiated samples of a solution of OCDD in benzene-hexane for 1 to 24 hours with a mercury ultraviolet lamp. After 4 hours of exposure, 30 percent of the OCDD remained unchanged; the major reaction products were hexa- and hepta-CDD's and trace amounts of penta-CDD's. After 24 hours of irradiation, the hexa- and hepta-CDD's still constituted the major reaction products, with significant amounts of penta-CDD's and trace amounts of TCDD's. Only 10 percent of the initial OCDD remained unchanged. It was concluded that since some commercial products contain up to several hundred ppm of the octa- and hepta-CDD's, photolytic formation of more toxic polychlorinated dioxins could have environmental significance.

Exposure of TCDD's and DCDD's in isooctane and 1-octanol to artificial sunlight (General Electric RS sunlamp) showed that both substances had half-lives of about 40 minutes in each solvent (Stehl et al. 1973). Analysis of the mixtures after 24 hours of irradiation showed no 2,3,7,8-TCDD at a detection limit of 0.5 ppm. A bioassay of rabbit ear skin tissue to which the photolysis products had been applied revealed no chloracneogenic activity.

When a solution of OCDD and isooctane was exposed to artificial sunlight, about 80 percent of the OCDD remained unreacted after 18 hours. With a solution of OCDD and 1-octanol, about 94 percent of the OCDD remained unreacted after 20 hours (Stehl et al. 1973).

In a series of tests, thin layers of Herbicide Orange containing 15 ppm 2,3,7,8-TCDD were exposed to summer sunlight in glass petri dishes (Crosby and Wong 1977). After 6 hours, just over 40 percent of the dioxin remained. A commercial herbicide composed of butyl esters of 2,4-D and 2,4,5-T and containing 10 ppm 2,3,7,8-TCDD was exposed in the same manner; after 6 hours only about 30 percent of the initial dioxin remained. A commercial mixture containing no herbicides, but with 10 ppm 2,3,7,8-TCDD was also exposed to sunlight on glass petri dishes. The original dioxin concentration was reduced by about 90 percent after 2 hours. Herbicide Orange was applied in droplets to excised rubber plant leaves and to the surface of Sacramento loam soil; the samples were then exposed to sunlight. At an application rate of 6.7 mg, cm² of leaf surface, no TCDD's were detected on the leaves after 6 hours. At a lower application rate of 1.3 mg, cm², however, about 30 percent of the TCDD's remained after 6 hours. It was also reported that upon application to the soil (10 mg, cm²) approximately 90 percent of the dioxin remained after 6 hours. The authors attributed the lesser degree of photolysis of 2,3,7,8-TCDD on the soil partly to shading of lower layers by soil particles.

Investigators in this study concluded that there are three requirements for dioxin photolysis:

1. Dissolution in a light-transmitting film
2. Presence of an organic hydrogen donor
3. Ultraviolet light

In another study, 2,3,7,8-TCDD deposited on silica gel was irradiated with light having a wavelength greater than 290 nm. The original concentration of the dioxin was reduced by 92 percent after 7 days. When irradiation was done with light of shorter wavelength (>230 nm), the dioxin concentration was reduced by 98 percent after 7 days. It was concluded that cleavage of 2,3,7,8-TCDD was possible without a proton donor if the intensity of the sun at ground level was great enough to supply the required irradiation (Gebefuigi, Baumann, and Korte 1977).

In a study reported by Bertoni et al. (1978) about 150 ml m² of an ethyloleate-xylene mixture was sprayed on a 1-cm-deep sample of Seveso soil contaminated with 2,3,7,8-TCDD. More than 90 percent of the 2,3,7,8-TCDD was destroyed after 7 days of sunlight exposure. When a dioxin sample was placed in a room sprayed with ethyloleate-xylene mixture, disappearance of the dioxin was almost complete after 3 days exposure under a Phillips MLU 300 W lamp. The xylene was used to reduce viscosity, although ethyloleate was just as effective when used alone. The more rapid photolysis in the room was attributed mainly to the smooth walls of the room receiving the full intensity of the radiation, including the wavelength of light that was absorbed most readily by dioxins.

The smooth gradual decrease of dioxin concentration in the 1-cm-deep soil samples was unexpected because ultraviolet light does not penetrate soil. It was hypothesized that dioxin decomposition below the soil surface could result either from a diffusion mechanism in the oleate medium or from photolytic reactions occurring through long-lived free radicals.

The solubility and photodecomposition of 2,3,7,8-TCDD in cationic, anionic, and nonionic surfactants was studied by use of both pure dioxin samples and contaminated materials obtained from the Seveso area (Botre, Memoli, and Alhaique 1979). To test the effectiveness of the solubilizing agents, homogeneous soil samples were treated twice with surfactant and then three times with the same volume of water to remove the surfactant. Extracts from the residual soil were then obtained with benzene and methanol, and the extracts were analyzed for 2,3,7,8-TCDD. Untreated contaminated soil samples were used for standards. In the pure dioxin solubilization study, 4 ml of surfactant was used to treat the residues. Methanol was used as the reference solvent. The surfactants used were sodium dodecyl sulfate (SDS), and anionic surfactant, 1-hexadecylpyridinium sorbitan monooleate (Tween 80), hexadecyltrimethylammonium bromide, and 1-hexadecylpyridinium chloride (CPC).

Results showed that CPC was the best solubilizing agent for contaminated soil taken from the Seveso area, whereas in the pure dioxin experiment the differences were slight. Photodecomposition experiments performed using 2,3,7,8-TCDD dissolved in surfactants and in methanol also revealed CPC as the superior medium. Irradiation with an ultraviolet lamp for 4 hours destroyed about 90 percent of the dioxin in the CPC solution. Only 50 percent of the dioxin in the SDS solution was destroyed after 4 hours of irradiation, although almost 100 percent disappeared after 8 hours. Over 25 percent of the dioxin in methanol remained after 8 hours.

In a small-scale study in Seveso, olive oil was used in either a 40 percent aqueous emulsion or an 80 percent cyclohexanone solution and applied on a heavily contaminated area of grassland. These solutions supplied a hydrogen donor in an effort to facilitate photodegradation of the dioxin present. It was reported that after 9 days 80 to 90 percent of the 2,3,7,8-TCDD was destroyed, whereas concentrations in controls remained virtually unchanged (Wipf et al. 1978; Crosby 1978).

In a study of the fate of 2,3,7,8-TCDD in an aquatic environment, samples of lake sediment and water containing ¹⁴C-labeled 2,3,7,8-TCDD were incubated in glass vials under light and dark conditions for 39 days (Matsumura and Ward 1976). Results indicated no significant photolytic destruction of the dioxin. Whether artificial or natural light was used is not mentioned.

The fate of 2,3,7,8-TCDD in emulsifiable and granular silvex formulations was studied after application to microagroecosystems and outdoor field plots (Nash and Beall 1978). (Experimental conditions of this study are described more completely in the subsection on physical transport.) It was observed that upon volatilization, the dioxin in both the emulsifiable and granular formulations was photolyzed not only in direct sunlight but also in shaded areas outdoors and in filtered sunlight passing through the glass of the microagroecosystem chambers.

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The mean half-life of the dioxin in the emulsifiable concentrate was approximately 7.65 days; the half-life in the granular formulation was 13.5 days. The half-life of the dioxin in the emulsifiable formulation on grass in a microagroecosystem ranged from 5 to 7.5 days.

Crosby and Wong reported in 1973 that the major photodecomposition products of 2,4,5-T are 2,4,5-TCP, 2-hydroxy-4, 5-dichlorophenoxyacetic acid, 4,6-dichlororesorcinol, 4-chlororesorcinol, and 2,5-dichlorophenol; 2,3,7,8-TCDD was not detected as a photolysis product.

PHYSICAL TRANSPORT

This section describes studies of the movement of dioxins in or into soil, water, and air. Because of episodes involving actual contamination, such movement has become a critical issue. The transport of a chemical in the environment depends greatly upon the properties of the chemical: Is it soluble in water? Is it volatile? Does it cling to soils readily? With the answers to these questions, it is possible to at least postulate reasonably where these chemicals might be found following release into the environment and by what means human or animal receptors are most likely to be affected.

Transport in Soil

Many studies have addressed the mobility of dioxins, especially 2,3,7,8-TCDD, in soils. Generally it has been found that dioxins are more tightly bound to soils having relatively higher organic content. Dioxins applied to the surface of such soils generally remain in the upper 6 to 12 inches. They migrate more deeply into more sandy soils, to depths of 3 feet or more. In areas of heavy rainfall, not only is vertical migration enhanced but lateral displacement also occurs by soil erosion with runoff and, or flooding. Dioxins may appear in normal water leachate from soils that have received several dioxin applications.

Kearney et al. (1973b) studied the mobility of 2,7-DCDD and 2,3,7,8-TCDD in five different types of soil. They observed that the mobility of both dioxins decreased with increasing organic content of the soil. Based on this observation and the finding that these dioxins were relatively immobile in the soils tested, the conclusion was that these dioxins would pose no threat to groundwater supplies because they would not be mobilized deep into soils by rainfall or irrigation.

Similar conclusions were reached by Matsumura and Benezet (1973), who showed that mobility of 2,3,7,8-TCDD is relatively slow, much slower than that of DDT. It was concluded that any movement of 2,3,7,8-TCDD in the soil environment would be by horizontal transfer of soil and dust particles or by biological transfer (other than by plants).

During the 8-year period from 1962 to 1970, the U.S. Air Forces sprayed 170,000 pounds of 2,4-D, and 161,000 pounds of 2,4,5-T, in two herbicide formulations (Herbicide Orange and Herbicide Purple) over a test area 1 mile square at the Eglin Air Force Base in Florida (Commoner and Scott 1976). A map of this area is shown in Figure 64. Originally, the applications were done for the purpose of testing spray equipment to be used in Vietnam (Young 1974). The exact concentration of 2,3,7,8-TCDD in the herbicides used for the spraying tests is not known but is estimated to have ranged from 1 to 47 ppm. The test site has since been analyzed for dioxin residues. In 1970 a 36-in.-deep soil core was taken from a portion of the test area that had received approximately 947 pounds per acre of the 2,4-D, 2,4,5-T Herbicide Orange mixture (Woolson and Ensor 1973). At the limits of detection (0.1 to 0.4 ppb), no 2,3,7,8-TCDD was found at any depth. Several explanations were presented for the absence of dioxin: 1) the 2,4,5-T applied contained less than 2 ppm of 2,3,7,8-TCDD, a concentration undetectable in the soil by the analytical method used; 2) the dioxin had migrated to a depth below 36 inches because of the

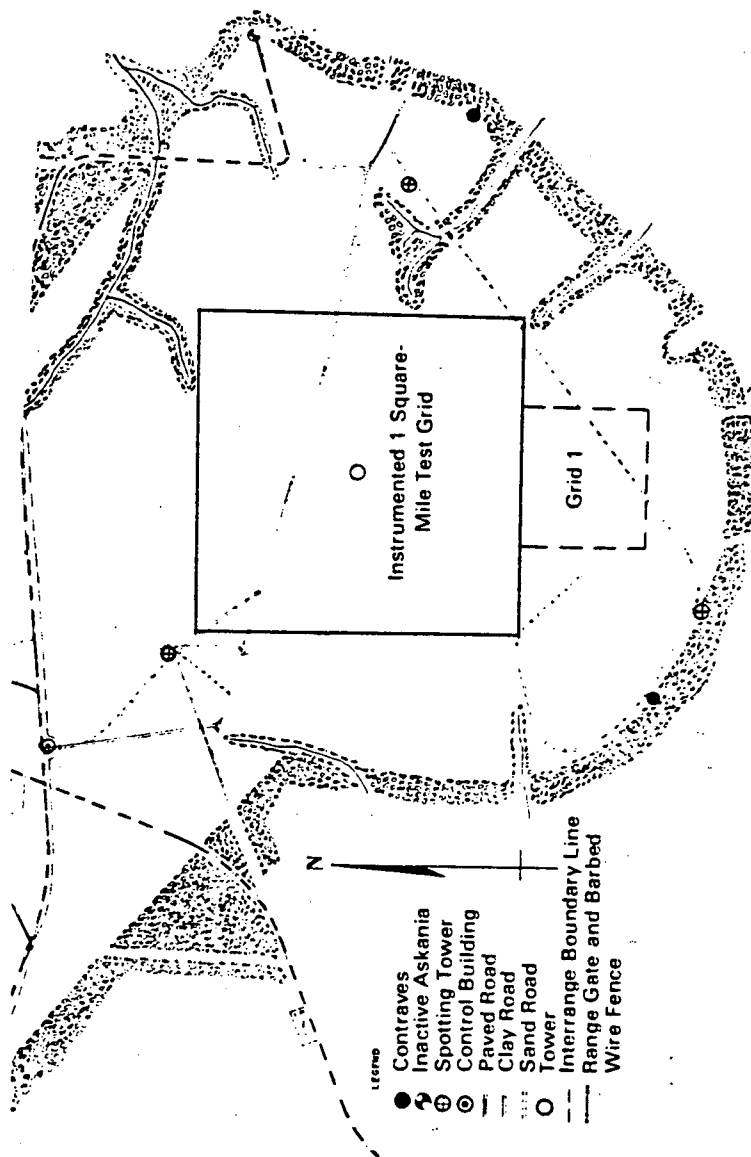


Figure 64. Map of Test Area C-52A, Eglin Air Force Base Reservation, Florida.

Source: Young, Thalken, and Ward 1975.

sandy nature of the soil and the high incidence of rainfall in the area; 3) wind erosion had displaced the dioxin; and 4) biological and/or photochemical decomposition had occurred.

In 1973, four soil samples were taken from the same test area and analyzed at low levels for 2,3,7,8-TCDD (Young 1974). The samples contained the dioxin in approximate concentrations of 10, 11, 30, and 710 ppt, and these concentrations were confined to the upper 6 in. of the soil layer.

From March, 1974, to February, 1975, the Air Force performed another study at the Eglin Air Force Base (Bartleson, Harrison, and Morgan 1975). Two test areas were studied, and also an area where the herbicides had been stored and loaded onto planes. The original 1-mile-square area sampled in 1971 and 1973 contained dioxin in concentrations up to 470 ppt. A second test area, designated Grid 1, contained concentrations of 2,3,7,8-TCDD as high as 1500 ppt. The highest dioxin concentrations were generally found in low-lying areas, and the lowest concentrations usually were in areas of loose sand; these findings indicate that the horizontal translocation had probably occurred through water runoff and wind and water erosion.

The storage and loading area contained up to 170,000 ppt of 2,3,7,8-TCDD. This area was elevated relative to a nearby pond. Limited sampling of the pond silt revealed a maximum concentration of 85 ppt, and 11 ppt was found in the pond drainage stream. These findings also indicated horizontal translocation of the dioxin, probably as a result of soil erosion.

A core sample of soil taken from Grid 1 in 1974 showed the following concentrations of 2,3,7,8-TCDD:

<u>Sample depth, in.</u>	<u>Concentration, ppt</u>
0-1	150
1-2	160
2-4	700
4-6	44

These data indicate some vertical movement of 2,3,7,8-TCDD, probably as a result of water percolation through the soil.

In another test, application of 0.448 kg m² of Herbicide Orange to a test site in Utah resulted in the following concentrations of 2,3,7,8-TCDD 282 days after application:

<u>Sample depth, in.</u>	<u>Concentration, ppt</u>
Control 0-6	<10
0-6	15,000
6-12	3,000
12-18	90
18-24	120

In 1978, additional measurements at the Utah test site were reported (Young et al. 1978). Table 51 presents analytical results of plot sampling 4 years after application of Herbicide Orange at various rates. Table 52 gives results of a similar test performed at Eglin Air Force Base in Florida.

In the tests reported in Tables 51 and 52, samples were taken by means of a soil auger. Subsequent tests revealed that dioxin-containing soil was being carried downward as a result of the auger sampling technique and that the concentrations of 2,3,7,8-TCDD below 6 in. were not detectable.

Followup studies of the residual levels of 2,3,7,8-TCDD in three loading areas of Eglin Air Force Base were conducted during the period from January 1976 to December 1978 (Harrison, Miller, and Crews 1979). Two of the loading areas were relatively free of contamination. The third (described above) had surface

**TABLE 51. CONCENTRATIONS OF 2,3,7,8-TCDD AT UTAH TEST RANGE
4 YEARS AFTER HERBICIDE ORANGE APPLICATIONS^a**
(parts per trillion)

Soil depth (inches)	Rate of Herbicide Orange application (lb/acre)		
	1000	2000	4000
0-6	650	1600	6600
6-12	11	90	200
12-18	NA ^b	NA	14

a—Source: Young et al. 1978.

b—NA = Not analyzed.

**TABLE 52. CONCENTRATIONS OF 2,3,7,8-TCDD AT EGLIN
AIR FORCE BASE 414 DAYS AFTER HERBICIDE ORANGE
APPLICATION^a**

Soil depth (inches)	Herbicide Orange (ppm)	2,3,7,8-TCDD
		concentration in soil (ppt)
0-6	1866	250
6-12	263	50
12-18	290	<25 ^b
18-24	95	<25 ^b
24-30	160	<25 ^b
30-36	20	<25 ^b

a—Source: Young et al. 1976.

b—Detection limit.

soil concentrations of TCDD's as high as 275 ppb. TCDD's were found at 1 meter depths at concentrations one-third the surface amount.

The accident at Seveso in July 1976 released quantities of 2,3,7,8-TCDD estimated to range from 300 g to 130 kg over an area of approximately 250 acres (Carreri 1978). Because the Seveso soil is drained by an underlying gravel layer, much concern has arisen over the possibility of groundwater contamination. Early soil migration studies in some of the most contaminated areas at Seveso showed that the dioxin penetrated to a depth of 10 to 12 in. Later studies reported by Bolton (1978) found 2,3,7,8-TCDD at soil depths greater than 30 in. An observed 70 percent decrease in 2,3,7,8-TCDD soil concentration over a period of several months may support the suggestion that the dioxin can be mobilized laterally as well as vertically from soils during heavy rainfall or flooding (Commoner 1977).

Following the incident at Verona, Missouri, when oil contaminated with 2,3,7,8-TCDD was sprayed on a horse arena to control dust, the top 12 in. of soil was removed and replaced with fresh soil. After removal and replacement of the

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soil, no further episodes occurred involving sickness or death of human beings or animals. Investigators concluded that this supported the notion that the vertical mobility of TCDD's is limited (Commoner and Scott 1976).
Nash and Beall (1978) report studies of the fate of 2,3,7,8-TCDD by use of microagroecosystems and outdoor field plots. A diagram of the microagroecosystem is shown in Figure 65. Two commercially available silvex formulations, one granular and one emulsifiable, were tested. The test and control formulations were applied three times to turf in five microagroecosystems and once to turf on the outdoor plots. Throughout the test period a sprinkler system applied water to the soils to simulate rainfall.

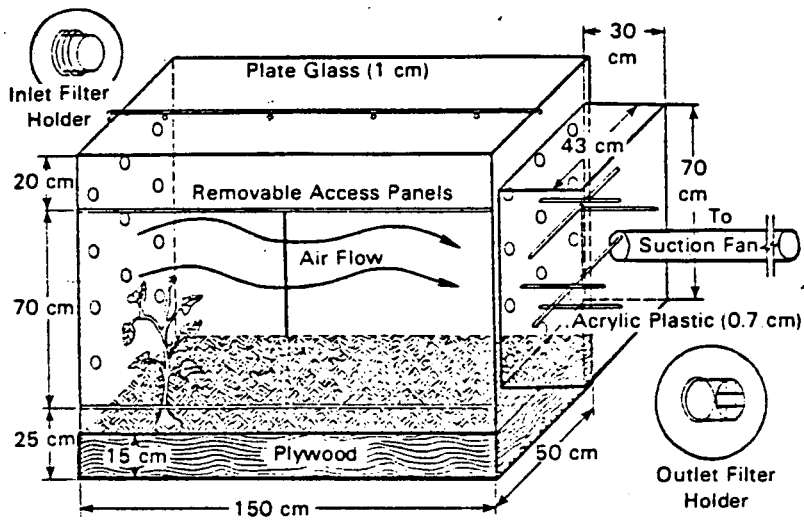


Figure 65. Diagram of microagroecosystem chamber.

The 2,3,7,8-TCDD used in the study was labeled with radioactive hydrogen or ³H. Throughout the study the labeled dioxin (or breakdown product) was tracked by extremely sensitive radiochemical assay methods. The presence of the dioxin molecule in samples was confirmed by gas-liquid chromatography.

In the first two applications (on days 0 and 35) the concentration of 2,3,7,8-TCDD in the silvex was 44 ppb. In the third application (on day 77) the silvex formulations contained 7500 ppb (7.5 ppm) 2,3,7,8-TCDD. Soil, water, air, grass, and earthworms were analyzed for 2,3,7,8-TCDD at various times following each of the herbicide applications.

Soil analyses showed that most (~80 percent) of the applied 2,3,7,8-TCDD remained in the top 2 cm of the soil. Trace levels at depths of 8 to 15 cm indicated some vertical movement of the dioxin in the soil.

Analysis of water leachate samples from the silvex-treated microagroecosystems following the first two herbicide applications showed no detectable 2,3,7,8-TCDD (limits of detection were 10⁻¹⁶ g/g*). The dioxin was detected later, however, following the third herbicide application, and maximum concentrations of 0.05 to 0.06 ppb were calculated to possibly be found in the leachate samples taken 7 weeks after that third application.

*10⁻¹⁶ g/g may also be expressed as 0.1 fg/g (0.1 femtogram per gram). It is equivalent to 0.0001 ppt.

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In an ongoing study at Rutgers University, 54 soil-core samples (6 in. in depth) have been taken from samples of turf and sod from areas in the United States having histories of silvex and/or 2,4-D applications. The EPA will analyze the samples for dioxins or herbicide residues. Results are not yet available (Hanna and Goldberg, n.d.).

Transport in Water

Contamination of streams and lakes by 2,3,7,8-TCDD has also been of concern, especially because of the spraying of 2,4,5-T on forests to control underbrush. Possible routes of water contamination from spraying are direct application, drift of the spray, and overland transport after heavy rains. The latter, however, seldom occurs on forest lands because the infiltration capacity of forest floors is usually much greater than precipitation rates (Miller, Norris, and Hawkes 1973).

The transport of dioxin-contaminated soil into lakes or streams by erosion constitutes another possible route of contamination. This is evidenced by the detection of 2,3,7,8-TCDD in water samples from a Florida pond adjacent to a highly contaminated land area (Bartleson, Harrison, and Morgan 1975). Additionally, several laboratory studies have shown that lakes or rivers could become contaminated with minute quantities (ppt) of 2,3,7,8-TCDD and possibly other dioxins through leaching from contaminated sediments. In a study reported by Isensee and Jones (1975), 2,3,7,8-TCDD was adsorbed to soils, which were then placed in aquariums filled with water and various aquatic organisms. Concentrations of the dioxin in the water ranged from 0.05 to 1330 ppt. These values corresponded to initial concentrations of 2,3,7,8-TCDD in the soil ranging from 0.001 to 7.45 ppm. The investigators concluded that dioxin adsorbed to soil as a result of normal application of 2,4,5-T would lead to significant concentrations of 2,3,7,8-TCDD in water only if the dioxin-laden soil was washed into a small pond or other small body of water.

Other investigations have shown similar results. Using radiolabeled 2,3,7,8-TCDD, Matsumura and Ward (1976) showed that, after separation from lake-bottom sediment, water contained 0.3 to 9 percent of the original dioxin concentration added to the sediment. Results of another test indicated that a total of about 0.3 percent of the applied dioxin concentration passed through sand with water eluate (Matsumura and Benezet 1973). In some cases, the observed concentration of TCDD's in the water was greater than its water solubility (0.2 ppb). The 1976 report suggests that some of the radioactivity apparent in the aqueous phase was probably due to a combination of lack of dioxin degradation, presence of 2,3,7,8-TCDD metabolites, and binding or adsorption of TCDD's onto organic matter or sediment particles suspended in the water.

In another study, application of ¹⁴C-TCDD to a silt loam soil at concentrations of 0.1 ppm led to ¹⁴C-TCDD concentrations in the water ranging from 2.4 to 4.2 ppt over a period of 32 days (Yockim, Isensee, and Jones 1978).

The findings of such investigations are consistent with recent reports that TCDD's are migrating to nearby water bodies from industrial chlorophenol wastes buried or stored in various landfills. At Niagara Falls, New York, for example, 1.5 ppb TCDD's have been detected at an onsite lagoon at the Hyde Park dump where 3300 tons of 2,4,5-TCP wastes are buried (Chemical Week 1979a; Wright State University 1979a,b). Sediment from a creek adjacent to the Hyde Park fill (also in the Niagara Falls area) is also contaminated with ppb levels of the dioxin (Chemical Week 1979a, 1979d). In Jacksonville, Arkansas, there is growing evidence that TCDD's may have migrated from process waste containers in the landfill of a former 2,4,5-T production site. The dioxins have been found both in a large pool of surface water on the site (at 500 ppb) and downstream of the facility in the local sewage treatment plant, in bayou-bottom sediments, and in the flesh of

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mussels and fish (Richards 1979; Fadiman 1979; Cincinnati Enquirer 1979; Tiernan et al. 1980). TCDD's apparently are also being leached into surface and groundwaters from an 880-acre dump site of the Hooker Chemical Company at Montague, Michigan (Chemical Week 1979c; Chemical Regulation Reporter 1979b). Dioxins were found at the site at levels approaching 800 ppt.

Transport in Air

One study has been identified in which levels of 2,3,7,8-TCDD in air have been measured (Nash and Beall 1978). Femtogram (10^{-15} g) quantities of the dioxin were detected in the air after granular and emulsifiable silvex formulations containing radiolabeled 2,3,7,8-TCDD had been applied to microagroecosystems. Air concentrations of the dioxin decreased appreciably with time following application. The data appear to confirm that TCDD has a very low vapor pressure and that loss due to volatilization is extremely low, especially when low levels of 2,3,7,8-TCDD are involved and granular formulations containing the dioxin are used.

Results of other investigations indicate that water-mediated evaporation of TCDD's may take place (Matsumura and Ward 1976).

Transport of dioxins by way of airborne particulates has recently received much attention. Several studies have shown the presence of dioxins in fly ash from municipal incinerators (Nilsson et al. 1974; Olie, Vermuelen, and Hutzinger 1977; Buser and Rappe 1978; Dow Chemical Company 1978; Tiernan and Taylor 1980). A recent report of Dow Chemical Company (1978) contends that particulates from various combustion sources may contain dioxins and that these dioxin-laden particulates are a significant source of dioxins in the environment. More details on these studies are presented in Section 3.

It has also been recently reported that dioxins from buried chlorophenol wastes are being mobilized by means of airborne dust particles (Chemical Regulation Reporter 1980a).

BIOLOGICAL TRANSPORT

This section discusses the potential for dioxins to accumulate and to become concentrated and magnified in biological tissues. In the past, pesticides (most notably DDT) have been found to accumulate in organisms at almost every trophic level. In some organisms, these chemicals have been concentrated in the tissues. When an animal in a higher trophic level feeds on organisms that accumulate these chemicals, the animal receives several "doses" of the chemical, resulting in what is termed biomagnification. If this process proceeds to higher levels in the food chain, the chemicals may become concentrated hundreds or thousands of times, with possibly disastrous consequences.

The ability for a chemical to accumulate and to become concentrated or participate in biomagnification depends primarily on its availability to organisms, its affinity for biological tissues, and its resistance to breakdown and degradation in the organism.

Bioaccumulation, Bioconcentration, and Biomagnification in Animals

The biological activity of dioxins with respect to accumulation, concentration, and magnification has been addressed by several researchers. Briefly, bioaccumulation is the uptake and retention of a pollutant by an organism. The pollutant is said to be bioconcentrated when it has accumulated in biological segments of the environment. The increase of pollutant concentrations in the tissues of organisms at successively higher trophic levels is biomagnification.

Several investigators (Fanelli et al. 1979, 1980; Frigerio 1978) have studied the levels of TCDD's in animals captured in the dioxin-contaminated area near Seveso, Italy. Data shown in Table 53 indicate that TCDD's accumulate in environmentally exposed wildlife. All field mice were found to contain TCDD's at whole-body concentrations ranging from 0.07 to 49 ppb (mean value 4.5 ppb). The mice were collected from an area where the soil contamination (upper 7 cm) varied from 0.01 to 12 ppb (mean value 3.5 ppb). These data are in agreement with Air Force studies by Young et al. (described below), which indicate that rodents living on dioxin-contaminated land concentrate TCDD's in their bodies only to the same order of magnitude as the soil itself; biomagnification does not occur. Several rabbits and one snake have been found to concentrate TCDD's in the liver. The snake also had accumulated a very high level of TCDD's in the adipose (fat) tissue. Liver samples from domestic birds were analyzed for TCDD's with negative results.

TABLE 53. TCDD LEVELS IN WILDLIFE^a

Animal	No. of samples analyzed	Tissue	Positive	TCDD level (ng/g) (ppb)	
				Average	Range
Field mouse	14	Whole body	14/14	4.5	0.07-49
Hare	5	Liver	3/5	7.7	2.70-13
Toad	1	Whole body	1/1	0.2	
Snake	1	Liver	1/1	2.7	
		Adipose tissue	-	16.0	
Earthworm	2 ^b	Whole body	1/2	12.0	

a—Source Fanelli et al. 1980.

b—Each sample represents a 5-g pool of earthworms.

Earlier studies by the Air Force evaluated alternative methods for disposal of an excess of 2.3 million gallons of Herbicide Orange left from the defoliation program in Southeast Asia. The studies took place at the test site at Eglin Air Force Base in Florida (Figure 64) and at test areas in Utah and Kansas.

In June and October of 1973, samples of liver and fat tissue of rats and mice collected from grids on a 3-mile-square test area (TA C-52A) at Eglin Air Force Base were analyzed for the presence of TCDD's (Young 1974). The samples contained concentrations of TCDD's ranging from 210 to 542 ppt. Tissue of control animals contained less than 20 ppt TCDD's. Because most of the concentrations of TCDD's in the group of animals tested were higher than those found in the soil, it was suggested that biomagnification might have occurred; however, because the animals studied failed to show teratogenic or pathologic abnormalities, the presence of a substance similar to TCDD's but with a lower biologic activity was postulated.

Another Air Force report gives results of additional studies conducted at Eglin Air Force TA C-52A (Young, Thalken, and Ward 1975). In an effort to test the possible correlation between levels of TCDD's in the livers of beach mice and in soil, experiments were conducted to determine the possible exposure routes. Because contamination by TCDD's could be detected only in the top 6 in. of soil, it

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was thought that a food source might be responsible for the presence of the dioxin in animal tissue. Analysis of seeds (a food source for beach mice) collected in the area revealed no TCDD's (at 1 ppt detection level); therefore, another route of contamination was suggested. Since the beach mouse spends as much as 50 percent of its time grooming, investigators postulated that the soil adhering to the fur of the mice as they move to and from their burrows was being ingested. As a test of this hypothesis, a dozen beach mice were dusted 10 times over a 28-day period with alumina gel containing TCDD's. Analysis of pooled samples of liver tissue from controls indicated concentrations of TCDD's of less than 8 ppt (detection limit), whereas concentrations in samples of tissue from the dusted mice reached 125 ppt.

Further analysis was done on samples of liver tissue from beach mice collected from Grid 1 of TA C-52A. A composite sample of male and female liver tissue contained TCDD's at levels of 520 ppt, and a composite sample of male tissue contained 1300 ppt. In contrast, the liver tissue of mice collected from control field sites contained TCDD's in concentrations ranging from 20 ppt (male and female composite) to 83 ppt (female composite). Air Force researchers concluded that although bioaccumulation was evident, there were no data to support biomagnification because the levels of TCDD's in the liver tissue of beach mice were in general no greater than levels found in the soil on Grid 1 (ranging from <10 to 1500 ppt).

In evaluation of this Air Force study Commoner and Scott (1976) again reached a different conclusion. Because dioxin concentrations in the pooled liver samples represented an average value for the mice, they believed that this value should be compared with average value for TCDD's in the soil of Grid 1, which was 339 ppt. They concluded that biomagnification was evidenced by the significantly higher levels of TCDD's in mouse liver than in soil.

Analysis for TCDD's in the six-lined racerunner, a lizard found in the area, showed concentrations of 360 ppt in a pooled sample of viscera tissue and 370 ppt in a pooled sample of tissue from the trunks of specimens captured in TA C-52A. Specimens captured at a control site showed concentrations of TCDD's less than 50 ppt (detection limit).

Early studies of aquatic specimens obtained from ponds and streams associated with TA C-52A showed no TCDD's at a detection limit of less than 10 ppt (Young 1974). In further studies, however, three fish species showed detectable (ppt) levels of TCDD's (Young, Thalken, and Ward 1975). Pooled samples of skin, gonads, muscle, and gut from a species of bluegill, *Lepomis punctatus*, contained 4, 18, 4, and 85 ppt TCDD's, respectively. All of these specimens were obtained from the Grid 1 pond on TA C-52A, where bluegill was at the top of the food chain. Two other fish species, *Notropis lypselopterus* (sailfin shiner) and *Gambusia affinis* (mosquito fish), also showed 12 ppt of TCDD's. These specimens were collected from Trout Creek, a stream draining Grid 1. (Mosquito fish samples consisted of bodies minus heads, tails, and viscera, whereas shiner samples consisted of gut.) Inspection of gut contents of *Lepomis* specimens from Trout Creek showed that the food source of this fish consisted mostly of terrestrial insects. The source of the TCDD's was not identified, however.

In another Air Force study, tests were done on 22 biological samples from TA C52A and 6 samples (all fish) from the pond at the hardstand-7 loading area designated as HS-7 (Bartleson, Harrison, and Morgan 1975). A composite of whole bodies of 20 mosquito fish *Gambusia* collected from the HS-7 pond and 600 feet downstream showed a concentration of 150 ppt TCDD's. Liver samples from six small sunfish from the HS-7 pond also showed 150 ppt TCDD's, whereas samples of the livers and fat of 12 medium-sized sunfish from the HS-7 pond showed concentrations of 0.74 ppb. Because the solubility of 2,3,7,8-TCDD in water is far below these levels (0.2 ppb), the data seem to indicate biomagnification in addition to bioaccumulation. The stream that drains the HS-7 pond flows north into a larger pond known as Beaver Pond. Composite samples of four whole large

fish from Beaver Pond showed a concentration of 14 ppt TCDD's. The livers of 25 large fish and fillets of 8 large fish from Beaver Pond showed no TCDD's at a detection limit of 5 ppt. A followup study conducted from 1976 to 1978 showed that TCDD's were present in turtle fat and beach mouse liver and skin (Harrison, Miller, and Crews 1979).

In the same study, samples obtained from deer, meadowlark, dove, opossum, rabbit, grasshopper, six-lined racerunner, sparrow, and miscellaneous insects from TA C-52A were analyzed for TCDD's. TCDD's were detected in the livers and stomach contents of all of the birds. One composite sample of meadowlark livers contained 1020 ppt TCDD's, the highest level found in all samples. No TCDD's were detected in samples from deer, opossum, or grasshopper. The sample from miscellaneous insects contained 40 ppt TCDD's, and the composite sample from racerunners, 430 ppt TCDD. The authors concluded that this study demonstrated bioaccumulation. The data also indicate that biomagnification may have occurred. Commoner and Scott (1976b) point out that the average concentration of TCDD's in soil from TA C-52A was 46 ppt. It should also be noted that the composite insect sample most likely included insects that are eaten by the birds. In all cases the concentration of TCDD's in animal liver samples was greater than that in the insect sample, an indication of the possibility of biomagnification. Because none of the Air Force studies analyzed for TCDD's in a series of trophic levels, biomagnification was not clearly demonstrated.

Woolson and Ensor (1972) analyzed tissues from 19 bald eagles collected in various regions of the country in an effort to determine whether dioxins were present at the top of a food chain. At a detection limit of 50 ppb, no dioxins were found.

Another study failed to show dioxin contamination in tissues of Maine fish and birds (Zitco, Hutzinger, and Choi 1972).

In a similar study 45 herring gull eggs and pooled samples of sea lion blubber and liver were analyzed for dioxins and various other substances (Bowes et al. 1973). Analysis by gas chromatography with electron capture and high-resolution mass spectrophotometry revealed no dioxins.

Fish and crustaceans collected in 1970 from South Vietnam were analyzed for TCDD's in an effort to determine whether the spraying of Herbicide Orange had led to accumulation of TCDD's in the environment (Baughman and Meselson 1973). Samples of carp, catfish, river prawn, croaker, and prawn were collected from interior rivers and along the seacoast of South Vietnam and were immediately frozen in solid CO₂. Butterfish collected at Cape Cod, Massachusetts, were analyzed as controls. Samples of fish from the Dong Nai River (catfish and carp) showed the highest levels of TCDD's, ranging from 320 to 1020 ppt. Samples of catfish and river prawn from the Saigon River showed levels ranging from 34 to 89 ppt. Samples of croaker and prawn collected along the seacoast showed levels of 14 and 110 ppm of TCDD's, whereas in samples of butterfish from Cape Cod the mean concentration of TCDD's was under 3 ppt (detection limit). The authors concluded that TCDD's had possibly accumulated to significant environmental levels in some food chains in South Vietnam.

Other investigators have studied the accumulation of TCDD's in mountain beavers after normal application of a butylester of 2,4-D and 2,4,5-T to brushfields in western Oregon (Newton and Snyder 1978). They reported that the home range of the mountain beavers was small and that among all animals collected inside the treatment areas the home ranges centered at least 300 feet from the edge of the treatment area. Thus their food supplies, consisting primarily of sword fern, vine maple, and salmonberry, had definitely been exposed to the herbicide. Analysis of 11 livers from the beavers showed no TCDD's in 10 of the samples at detection limits of 3 to 17 ppt. One sample was questionable; the concentration was calculated at 3 ppt TCDD's.

Investigators in another study analyzed milk from cows that grazed on pasture

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and drank from ponds that had received applications of 2,4,5-T (Getzendaner, Mahle, and Higgins 1977). Sample collection ranged from 5 days to 48 months after application; 14 samples were collected within 1 year after application. Application rates ranged from 1 to 3 pounds per acre. Milk purchased from a supermarket was used as the control. The control samples contained levels of TCDD's ranging from nondetectable to 1 ppt. No milk samples from cows grazing on treated pasture contained levels of TCDD's above 1 ppt.

In a similar study, milk samples were collected throughout the Seveso area just after the ICMESA accident occurred (Fanelli et al. 1980). The samples were analyzed for TCDD's by GC-MS methods. Results are given in Table 54. Figure 66 shows the sites where the milk samples were collected. Dioxin levels were highest in samples from farms close to the ICMESA plant. The high levels of TCDD's found in the milk samples strongly suggest that human exposure via oral intake must have occurred after the accident through consumption of dairy products. A milk monitoring program that has been sampling milk from outside Zone R since 1978 no longer detects TCDD's in any of the samples.

Three research teams have analyzed fat from cattle that had grazed on land where 2,4,5-T herbicides were applied. In one study, five of eight samples collected from the Texas A & M University Range Science Department in Mertzon, Texas, showed the possible presence of TCDD's at low ppt levels when analyzed by gas chromatography low-resolution mass spectrometry (Kocher et al. 1978).

TABLE 54. TCDD LEVELS IN MILK SAMPLES COLLECTED NEAR SEVESO
IN JULY-AUGUST 1976^a

Map number ^b	Date of collection	TCDD concentration (ng/liter) (ppt)
1	7/28	76
2	7/28	7919
	8/2	5128
	8/10	2483
3	7/28	469
	8/2	1593
	8/10	496
4	8/10	1000
5	7/29	116
6	7/29	59
7	8/3	80
8	8/3	94
9	7/27	180
	8/3	75
10	8/5	<40

a—Source: Fanelli et al. 1980.

b—Locations shown in Figure 66.

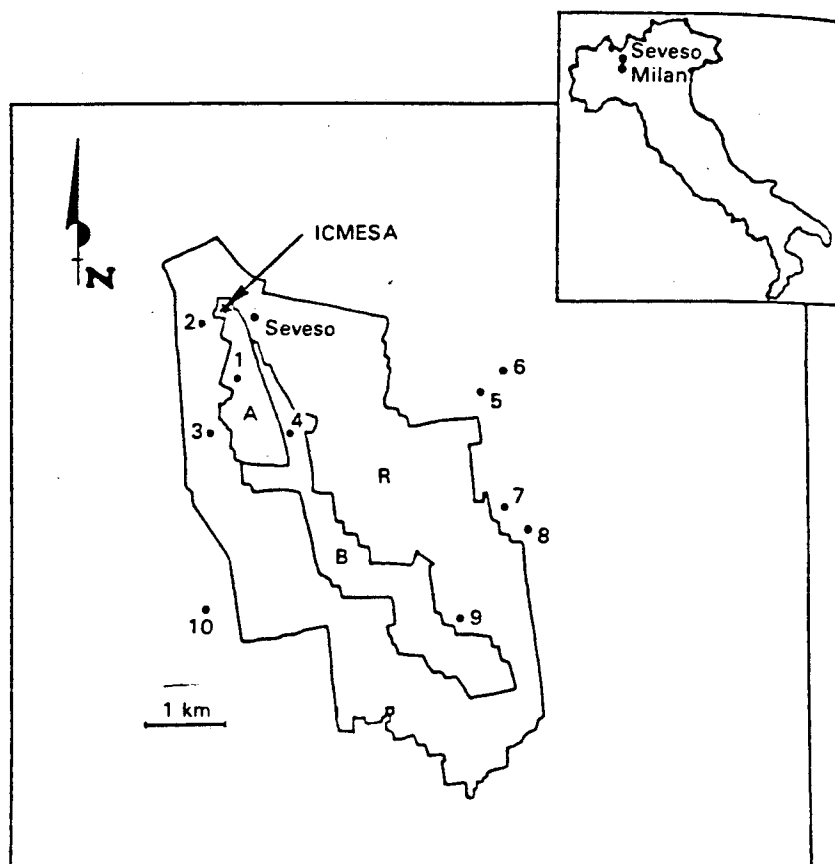


Figure 66. Location of farms near Seveso at which cow's milk samples were collected for TCDD analysis in 1976 (July-August).

Source: Fanelli et al. 1980.

Apparent TCDD concentrations ranged from 4 to 15 ppt at detection limits ranging from 3 to 6 ppt. In the second study, 11 of 14 samples analyzed contained TCDD's (Meselson, O'Keefe, and Baughman 1978). The four highest levels reported were 12, 20, 24, and 70 ppt TCDD. In the third study, Solch et al. (1978, 1980) detected TCDD's in 13 of 102 samples of beef fat at levels ranging from 10 to 54 ppt.

Shadoff and co-workers could find no evidence that TCDD's are bioconcentrated in the fat of cattle (Shadoff et al. 1977). The animals were fed ronnel insecticide contaminated with trace amounts of TCDD's for 147 days. Sample cleanup was extensive to permit low-level detection of the dioxin. Analysis was by combined gas chromatography-mass spectrometry (both high and low resolution). No TCDD's were detected at a lower detection limit of 5 to 10 ppt.

Samples of human milk obtained from women living in areas where 2,4,5-T is used have also been analyzed for dioxins. In one study, four of eight samples were reported to contain about 1 ppt TCDD's (Meselson, O'Keefe, and Baughman 1978). In a subsequent study, no evidence of 2,3,7,8-TCDD contamination was found in 103 samples of human milk collected in western states (Chemical

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Regulation Reporter 1980). The lower level of detection in the latter study ranged from 1 to 4 ppt.

Model ecosystems have been developed in aquariums to study the bioaccumulation and concentration of several pesticides including TCDD's (Matsumura and Benezet 1973). Concentration factors for TCDD's calculated from these studies were:

Daphnia: 2198
Ostracoda: 107

Mosquito larvae: 2846
Northernbrook silverside fish: 54

The authors concluded that the biological and physical characteristics of organisms played an important role in the bioaccumulation and concentration of TCDD's and the other pesticides studied. They also indicated that because of the low solubility of TCDD's in water and liquids and their low partition coefficient in liquids, TCDD's are not likely to accumulate in biological systems as readily as DDT.

Another aquatic study involved a recirculating static model ecosystem in which fish were separated from all the other organisms (algae, snails, daphnia) by a screened partition (Yockim, Isensee, and Jones 1978). In this study ¹⁴C-TCDD was added to 400 g of Metapeake silt loam clay to yield TCDD's at a concentration of 0.1 ppm. Treated soils were placed in the large chambers of the ecosystem tanks and flooded with 16 l of water. One day after the water addition, all organisms except the catfish were added. Samples of organisms and water were collected on days 1, 3, 7, 15, and 32. On day 15 a second group of 15 mosquito fish was added. On day 32 all organisms remaining were collected and counted. Also on day 32, nine channel catfish were added to the large chambers of the tanks containing the soil. Catfish were collected 1, 3, 7, and 15 days later. Of the two collected on each day, one was sacrificed for analysis and one was placed in untreated water.

Bioaccumulation ratios (tissue concentration of TCDD's divided by water concentration) for the algae ranged from 6 to 2083, the maximum exhibited after 7 days. Bioaccumulation ratios for the snails ranged from 735 to 3731, with the maximum at 15 days. The ratios in daphnia ranged from 1762 to 7125, with the maximum at 7 days. The accumulation ratios in the mosquito fish ranged from 676 at day 1 to 4875 after 7 days. All mosquito fish were dead after 15 days, and their tissues showed an average of 72 ppb TCDD's. No bioaccumulation ratios were calculated for the catfish, but levels of TCDD's in the tissues ranged from 0.9 ppt after day 1 to 5.9 ppt after day 15. By day 32 of exposure, all catfish had died. The average concentration of TCDD's in the tissue at this time was 4.4 ppb.

It was concluded that under normal use of 2,4,5-T, concentration of TCDD's in sediments of natural water bodies would probably be 10⁴ to 10⁶ times lower than the concentration used in this experiment, and although the TCDD's could be a potential environmental hazard, the magnitude of the hazard would depend on biological availability and persistence in the aquatic ecosystem under conditions of normal use.

In previously mentioned studies with microagroecosystems, earthworms contained 0.2 and 0.3 ppt 2,3,7,8-TCDD and/or breakdown products of TCDD's following two silvex applications to soil (Nash and Beall 1978). The silvex contained 44 ppb TCDD's.

Another study not yet completed concerns the possible accumulation of dioxins in vegetation and earthworms in turf and sod of areas having a history of silvex and/or 2,4-D applications (Hanna and Goldberg, n.d.).

Isensee and Jones (1975) performed three experiments using algae, duckweed, snails, mosquito fish, daphnia, channel catfish and other organisms. Radiolabeled dioxin (¹⁴C-TCDD) was adsorbed to two types of soil, which were then placed in glass aquariums and covered with water. One day later, daphnia, algae, snails, and various diatoms, protozoa, and rotifers were added. In one experiment duckweed plants were also added on the second day. After 30 days, some daphnia were

analyzed and two mosquito fish were added to each tank. Three days later, all organisms were harvested; in Experiments II and III, two fingerling channel catfish were added to each tank and exposed for 6 days. At the conclusion of each experiment the concentrations of ^{14}C -TCDD in the water and in the organisms were determined and the concentration factors calculated. Table 55 summarizes soil application rates in each experiment and type of soil used.

TABLE 55. SOIL APPLICATION RATES AND REPLICATIONS^a

Total ^{14}C -TCDD added per tank (μg)	Type of soil ^b and amount of ^{14}C -TCDD added (g)	Final concentrations of ^{14}C -TCDD (ppm) ^c	No. of replicates
	Experiment I		
149	L-20	7.45	3
0	L-20	0.00	1
	Experiment II		
63	L-20	3.17	2
63	L-20 + M-100	0.53	2
63	L-20 + M-200	0.29	2
63	L-20 + M-400	0.15	2
0	L-20	0.00	2
	Experiment III		
10	M-100	0.10	2
1	M-100	0.01	2
0.1	M-100	0.001	2
0.01	M-100	0.0001	2
0	M-100	0.00	2

a—Isensee and Jones 1975.

b—L = Lakeland sandy loam; M = Metapeake silt loam. In Experiment II, L was first treated with ^{14}C -TCDD, then dry-mixed with M in treatment tanks.

c—Soil concentrations based on total quantity of soil in tanks.

At soil concentrations as low as 0.1 ppb, ^{14}C -TCDD was leached into the water and accumulated in the organisms. Bioaccumulation factors at this soil concentration and a water concentration of 0.05 ppt were 2,000 for algae, 4,000 for duckweed, 24,000 for snails, 48,000 for daphnia, 24,000 for mosquito fish, and 2,000 for catfish, corresponding to concentrations of 0.1, 0.2, 1.2, 2.4, and 0.1 ppb of ^{14}C -TCDD in the tissues. Although some biomagnification was evident, results were highly variable. The differences in bioaccumulation factors found in this study relative to those of Yockim et al. (1978) were attributed to system design, differences in the organisms, and the fact that bioaccumulation factors in the other study were based on fresh weight whereas those in this study were based on dry weight.

The authors conclude that since some bioaccumulation ratios were relatively high (as compared with those observed with other pesticides), especially in daphnia and mosquito fish, the potential of TCDD's to accumulate in the environment is considerable. They further project, however, that at suggested application rates of 2.4.5-T, concentrations of TCDD's in the soil would probably not result in accumulation in biological systems unless erosion or runoff from recently sprayed areas is discharged to a small body of water (e.g., a pond).

Dow Chemical Company whether dioxin was treated was locations and in clear levels of TCDD 30 days after concentration tertiary effluent.

In a laboratory that the bioanalyzed Tittabawas ranging from sample with found in fish downstream preparation analyzed catfish.

Subsequent from the TCDD's were ppt. Catfish had the local sources can

Accumulation

Because where food may be in determine considered are accumulated

Kearney soybeans (0.06 ppm) in the above grains have and TCDD translocated

Studies of fruits, types of fish found in higher than samples and findings formed or be due photodegradation reported

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CATIONS^a

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Dow Chemical Company reported in 1978 on a series of studies to determine whether dioxins are present in the Tittabawassee River, into which Dow discharges treated wastes. In one study, rainbow trout were placed in cages at various locations above and below the Dow Midland plant, in a tertiary effluent stream, and in clear well water. Five of six fish placed in the tertiary effluent stream showed levels of TCDD's ranging from 0.2 to 0.05 ppb. Analysis of whole fish exposed for 30 days at a point 6 miles downstream of the effluent discharge showed concentrations of 0.01 and 0.02 ppb TCDD's. Analysis of whole fish from the tertiary effluent showed levels ranging from 0.05 to 0.07 ppb.

In a laboratory experiment with ¹⁴C-2,3,7,8-TCDD, Dow (1978) determined that the bioconcentration factor in rainbow trout was about 6600. Dow also analyzed native catfish taken randomly from various locations in the Tittabawassee River and tributaries. The analyses showed levels of TCDD's ranging from 0.07 to 0.23 ppb, levels of OCDD from 0.04 to 0.15 ppb, and one sample with 0.09 ppb of hexa-CDD. Highest levels of TCDD's and OCDD were found in fish collected from the Tittabawassee at points approximately 1 to 2 miles downstream from Dow. Dow noted that caustic digestion used in sample preparation may have degraded octa-, and hexachlorodioxins. No other fish analyzed contained detectable levels of TCDD's (Dow Chemical Company 1978).

Subsequent to the Dow studies, the U.S. EPA collected and analyzed fish samples from the Tittabawassee, Grand, and Saginaw Rivers in Michigan (Harless 1980). TCDD's were found in 26 of 35 samples (74 percent) at levels ranging from 4 to 690 ppt. Catfish and carp contained the highest concentrations, while perch and bass had the lowest. Additional information concerning dioxin in fish from different sources can be found on pages 175 and 178.

Accumulation in Plants

Because dioxins are sometimes used in herbicides applied on and near areas where food plants may be growing, it is important to determine whether the dioxins may be incorporated into the plants. Thus far, few studies have been done to determine whether dioxins might accumulate in plants. In the few studies that have considered this question, results seem to indicate that very small amounts are accumulated in plants.

Kearney et al. (1973a) studied the uptake of DCDD's and TCDD's from soil by soybeans and oats. Soil applications of ¹⁴C-DCDD (0.10 ppm) and ¹⁴C-TCDD (0.06 ppm) were made, and a maximum of 0.15 percent of the dioxins was detected in the above-ground portion of the oats and soybeans. No dioxins were found in the grains harvested at maturity. Application of a solution of Tween 80 (a surfactant) and TCDD's or DCDD's to the leaves of young oat and soybean plants showed no translocation to other plant parts after 21 days.

Studies of the absorption and transportation of TCDD's by plants in the contaminated area near Seveso have been reported (Cocucci et al. 1979). Samples of fruits, new leaves, and, in some cases, twigs and cork were taken from various types of fruit trees a year after the dioxin contamination occurred. TCDD's were found in all samples at $\mu\text{g/kg}$ levels. Concentrations in the leaves were 3 to 5 times higher than in the fruits, which had the lowest concentrations. Levels in the cork samples were generally higher than in the leaves, but not as high as in the twigs. The findings show that the dioxin is translocated from the soil by plants in newly formed organs and suggest that the lower concentrations in fruits and leaves may be due to some form of elimination such as transpiration or ultraviolet photodegradation. The latter possibility would agree with the photolysis results reported by Crosby and Wong in 1977.

Cocucci and co-workers also examined specimens of garden plants such as the carrot, potato, onion, and narcissus. Again $\mu\text{g/kg}$ levels of TCDD's were found. In all plants, the new aerial portions appeared to contain less dioxin than the

underground portions. Concentrations of TCDD's differed in the inner and outer portions of potato tubers and carrot taproots; the variation was attributed to the prevalence of conductive tissues in these plant parts. The authors again suggested that the relatively low concentrations in the aerial parts of these garden plants were due to an elimination process such as transpiration or photodegradation, or possibly to metabolism of the dioxin by the plants. The elimination hypothesis was supported by the further observation that when contaminated plants were transplanted in unpolluted soil, the dioxin content disappeared.

Young et al. (1976) used specially designed growth boxes to study the uptake of ^{14}C -TCDD by *Sorghum vulgave* plants. After placing Herbicide Orange containing 14 ppm ^{14}C -TCDD under the soil in the growth boxes, 100 plants were grown for 64 days. After 64 days the plants were harvested, extracted with hexane, and analyzed for ^{14}C -TCDD. Some plant samples were also analyzed for ^{14}C -TCDD before hexane extraction by combustion and collection of the CO_2 . Analysis before extraction showed a concentration of about 430 ppt ^{14}C -TCDD in the plant tissue. After hexane extraction, the concentration of ^{14}C -TCDD in the plant tissue was reported as being not significantly reduced. Young et al. concluded that the relatively high ^{14}C activity in the plant tissue could have been due to the presence of 1) nonhexane-soluble TCDD, 2) a soil biodegradation product of TCDD's that was taken up, 3) a metabolic breakdown product of TCDD's found after plant uptake of the TCDD's, or 4) a contaminant in the original ^{14}C -TCDD stock solution that was taken up by the plant.

As mentioned elsewhere, concentration of ^{14}C -TCDD in algae and duckweed has been observed. Bioaccumulation factors were 2000 and 4000, respectively (Isensee and Jones 1975).

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MEMONEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

TO FILE DATE 26 AUG 1987
FROM ES ROBERT BERETSKY, HSMS IV, BUREAU OF PLANNING AND ASSESSMENT
SUBJECT HUMMEL CHEMICAL COMPANY, NEWARK, ESSEX COUNTY

The writer spoke with Mr. Bernard Shoen of the Hummel Chemical Company concerning their facility in Newark, Essex County.

According to Mr. Shoen, the company was located at 185 Foundry St., in Newark but has not operated at the site for approximately 25 years. Mr. Shoen stated the company may have leased building #18 but he was not certain. He also stated that approximately 90% of the operation at the Newark facility consisted of warehousing.

The writer also spoke with officials of the Norpak/KEM Realty Company which had owned the property in the mid 1960's. According to Mr. Corasi of Norpak, Hummel Chemical did lease property at 185 Foundry St., but they could not find any records stating what buildings Hummel may have occupied.

HS203:mz

Attachment B-1

MEMO

NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

TO _____ FILE _____ DATE SEP 14 1987

FROM ROBERT BERETSKY, HSMS IV, BUREAU OF PLANNING AND ASSESSMENT

SUBJECT HUMMEL CHEMICAL COMPANY, NEWARK, ESSEX COUNTY

On 9/8/87, the writer spoke with Chief Busini of the Newark Fire Department concerning the subject facility. Chief Busini stated he spoke with fire inspectors who investigate the Foundry Street area but none of them have been with the fire department long enough to remember Hummel Chemical. Chief Busini then referred the writer to Newark Fire Department Engine 16 (201/733-7461) who are first responders to many fires. The writer spoke with Mr. Mertz of Engine 16 who stated he remembers Hummel Chemical being in the Foundry Street complex but does not know what buildings they occupied. Mr. Mertz also stated they responded to numerous fires and chemical spill incidents at the Foundry St. complex but he does not remember if any were at the Hummel Chemical facility.

HS203:mz

State of New Jersey
DEPARTMENT OF HEALTH
JOHN FITCH PLAZA
CN 360, TRENTON, N.J. 08625

February 8, 1982

Dr. Ramsey Christian
Compliance Officer
Hummel Chemical Company, Inc.
Harmich and Metuchen Roads
South Plainfield, New Jersey 07080

Dear Dr. Christian:

Enclosed please find a copy of our report on Hummel Chemical Company, Inc. It contains a brief description of the plant as well as an account of the two accidents which occurred in December of 1981. There are also recommendations included in the report, although they do not cover all areas of concern.

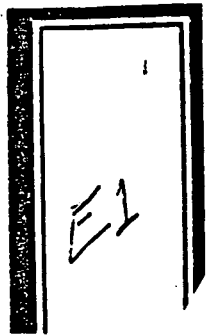
Andrew Rowland, an Occupational Health Specialist in our Program, will be contacting you to arrange health and safety training for your employees. We appreciate your cooperation and concern in this matter.

Sincerely,

Jerry Roseman
Program Specialist III
Occupational Health Program

JR/jmc

Attachment C-1



SECTION I - INTRODUCTION

Following is a report which discusses three site visits conducted at Hummel Chemical Company during December of 1981. Also included are recommendations regarding engineering controls, work practices and employee education aimed at reducing potentially hazardous occupational exposures at the plant.

Hummel Chemical Company, Incorporated, is presently located in South Plainfield, New Jersey. Previously the plant was located in Newark, New Jersey. The warehouse at the South Plainfield site is approximately 25,000 square feet in size. Hummel employs between 15 and 20 people. The company operates primarily as a chemical wholesaler; that is, a number of different chemicals are bought in relatively large quantities and are subsequently resold in smaller amounts, often with little or no processing. Sometimes, however, Hummel Chemical mixes, sifts, screens, mills or reacts chemicals in order to produce a desired product. The greatest potential for hazardous occupational exposures exists during these operations.

SECTION II - BACKGROUND

Hummel Chemical Company, Incorporated, is a small chemical wholesaler which engages in chemical processing to a limited degree. Most of the processing is mixing, milling and screening a variety of materials. A small percentage of production involves reacting chemicals such as hexachlorobenzene, hydrazine and others to produce contracted compounds.

There are a number of toxic chemicals on site at Hummel Chemical. Many of these pose a serious fire and/or explosion hazard as is evidenced by the history of such incidents at the South Plainfield Plant. Since

Hummel has been operating in South Plainfield that have been eight fires and one explosion reported. Most of the fires seem to be associated with similar causal conditions. There are many chemicals in the plant that are strong oxidizers. These include potassium nitrate, sodium nitrate and ammonium perchlorate, among others. Hummel also stores a number of organic chemicals, which can act as fuels. The fire and explosion hazards arise when an oxidizer comes in contact with a fuel in the presence of a spark, flame or some other ignition source. At Hummel, it appears that many of the fires started in those areas of the plant where the milling, mixing or screening of oxidizing materials are performed.

The two most recent accidents at the plant occurred on 12/1/81, and on 12/3/81. On 12/1/81 there was a fire at Hummel Chemical Company in which one employee was injured. Two days later there was an explosion at the plant. No one was injured in the second accident, although parts of the building suffered significant structural damage. According to South Plainfield Fire Chief John Cotone, the fire department is developing recommendations for Hummel Chemical to reduce the potential fire and explosion risks at the plant.

The Occupational Health Program was made aware of the situation at Hummel Chemical Company by Robert Kunze, Middlesex County Occupational Health Inspector. Mr. Kunze and the South Plainfield Fire Department, as well as the New Jersey Department of Environmental Protection's Hazard Management Unit, responded to both accidents.

According to company statements the operation that was being performed at the time of the 12/1 fire involved the screening of a product called SDR. SDR is a mixture of potassium nitrate, charcoal and sulfur. Ramsey Christian, the firm's compliance officer, informed us on our first visit to the plant on 12/10/81 that the exact cause of the fire was unknown; however, he felt that during the screening process a more active mixture than the one they were attempting to produce may have inadvertently formed. It was this "active mixture"

which could have been ignited if a spark was produced by dragging one of the steel rimmed drums across the concrete floor. On 12/3/81, Hummel Chemical Company was again the scene of an accident. This time an explosion occurred as the result of a reaction between chlorodinitrobenzene and ethylene glycol, which was being carried out in a 150 gallon stainless steel jacketed reactor. The material produced by the reaction of these two chemicals was dinitro-phenoxyethanol, a plasticizer used in rocket motor fuel. Again, Hummel representatives stated that they had been unable to discover the reasons for the accident.

SECTION III - DESCRIPTION OF PLANT OPERATIONS AND HAZARDS

The fire that occurred on 12/1/81 started in the "pit area" of the plant. Two types of operations are carried out in the pit area - milling and screening/sifting. Both processes are similar in that a powdered or crystalline raw material is poured through a screen in the floor of the upper level in the area. It then passes through a cloth tube before entering either the milling or screening/sifting machinery. After processing, the refined product is collected in fiber drums which are then sealed and prepared for shipment.

On 12/10/81 and 12/21/81 I, along with Middlesex County Health Inspector Robert Kunze, identified a number of potentially hazardous conditions at the plant. There was inhalation hazard posed by high concentrations of dust in the air of the pit area. We also experienced irritation to the skin, eyes and mucous membranes by certain chemicals (eg. potassium nitrate). There is also a potential risk of fire and/or explosion if high concentrations of oxidizers in the room air come into contact with a "fuel" in the presence of ignition source. In addition, there were potential health hazards associated with high noise levels and by the storage and handling of highly toxic and, in some cases, carcinogenic chemicals.

On 12/21/81, Hummel Chemical Company was engaged in the milling of pure potassium nitrate using the process described above. Two employees, one on the upper level and the other in the pit area, were responsible for the operation being performed. As the employee on the upper level slit open the bags of powdered potassium nitrate and poured it through the screen in the floor, large clouds of dust were evolved. As the potassium nitrate passed from the cloth tube into the milling machine clouds of dust again escaped into the workroom air. Finally, on the floor of the pit area where the second employee stood with the fiber drums to be filled, large quantities of dust covered the floor and contaminated the entire area. All walking - working surfaces were coated with dust. Both Robert Kunze and I experienced coughing and choking and a burning sensation to the skin, due to the concentration of potassium nitrate dust in the air. We were observing the operation from the warehouse where a number of highly toxic organic chemicals are stored. That the dust was present in the warehouse as well as the pit area is a source of concern.

SECTION IV - RECOMMENDATIONS

We feel that the employees at Hummel Chemical Company face a potentially hazardous situation. This judgement is based on the following factors: (1) A history of fires at Hummel Chemical Company; (2) Poor workpractices and housekeeping at the South Plainfield plant; (3) High dust concentrations in the pit area of the plant which may pose a health hazard as well as a fire hazard; (4) Employee exposure to high poise levels; (5) The lack of adequate ventilation or other engineering controls as a mechanism for reducing dust levels; (6) The lack of protective equipment worn by employees; and (7) The lack of effective worker education at Hummel Chemical Company.

It is hoped that the following recommendations, when implemented, will

begin to minimize the health and safety hazards posed by employees at Hummel Chemical Company. These recommendations do not represent a final or a comprehensive effort at correcting all the problems discussed in this report. Hummel Chemical Company should work with a qualified ventilation engineer in order to develop engineering controls based on the recommendations made in this section. Only with the help and cooperation of Hummel Chemical Company can we completely address and correct the wide range of health and safety problems which exist at the plant.

- (1) In order to minimize dust exposure to employees who are pouring chemicals through the grating in the floor of the upper level of the pit area, a portable canopy-type enclosure arrangement should be used to enclose the floor screening. The hood should include a slot into which a knife blade is mounted and which would be used to slit open the bags of material.
- (2) Consideration should be given to replacing the cloth tube used during milling operations with tubing material that would not retain large amounts of dust. This material, possibly plastic, should form a dust tight seal with any equipment it feeds into.
- (3) Another source of high dust exposure occurs as the material passes from the milling machinery into drums. There are a number of different types of drum hoods connected to a local exhaust system leading to a bag house which would be appropriate.
- (4) In consultation with a ventilation engineer it might prove feasible to design a ventilation system which encloses the entire milling and drum-filling operation. We could work with Hummel in contacting a consultant and in designing an acceptable system.
- (5) Drums should be made of materials that are flame resistant. To prevent the build-up of static electrical charges, drums, especially those with metal or plastic rims, should not be dragged across the workroom floor. A handtruck could be used to move the drums.

* Enclosed find copies of diagrams on bag filling and barrel filling operations from the "Industrial Ventilation Manual." Hopefully these can serve as illustrations of the types of designs which you could adopt.

- (6) All tools, including shovels, used in the pit area of the plant should be composed of non-sparking alloys such as beryllium or copper. A listing of local manufactures of such tools is attached.
- (7) If the Portasifter will be used to sift materials directly into drums, a gasket of some type must be used to provide a dust-proof seal. In order to minimize dust exposures to employees engaged in pouring chemicals through the sifter a hood arrangement similar to the one discussed in (1) of this section could be used.
- (8) Employees who work in the pit area performing milling and sifting operations should wear approved NIOSH respirators equipped with the proper filtering medium. They should also wear gloves and protective goggles. The health department can provide a listing of approved equipment.
- (9) Employee education should be conducted at Hummel Chemical Company covering such issues as exposure to toxic substances, the risk of fire and explosion in the pit area, the importance of personal protective equipment and other relevant topics.

The above recommendations are by no means exhaustive and deal primarily with the fire and explosion risks which exist at the plant. Further investigation and discussion need to be conducted with representatives of Hummel Chemical Company in order to effectively address some of the other potential health and safety problems faced by Hummel employees.



State of New Jersey
OFFICE OF ADMINISTRATIVE LAW

IN THE MATTER OF:) INITIAL DECISION
HUMMEL CHEMICAL COMPANY, INC.) OAL DKT. NO. EWR 5849-79

APPEARANCES:

Richard A. Ragsdale, Esq. for Petitioner

Rebecca Fields, D.A.G. for Respondent Agency

BEFORE THE HONORABLE SOLOMON METZGER, A.L.J.:

This matter arises out of the administrative order and notice of intent to assess a civil administrative penalty issued to Hummel Chemical Company by the Director of the Division of Water Resources (Agency) as a result of alleged violations of the New Jersey Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq., and regulations promulgated thereunder. Petitioner requested a hearing and the matter was transmitted to the Office of Administrative Law as a contested case pursuant to N.J.S.A. 52:14F-1, et seq. A hearing was commenced on May 9, 1980, continued on May 16 and brought to conclusion on May 29, 1980. The parties were permitted an opportunity to submit proposed findings of fact and supplementary written argument, and the last papers were received and the record closed on June 24, 1980.

Petitioner is in the business of processing chemicals for resale. The Agency asserted that as a result of its operations Petitioner had discharged chemical and other pollutants into the ground and surface waters of the State in contravention of law. It is seeking to impose a \$5,000 monetary penalty, and to require Petitioner to install monitoring wells on its site so that effects upon ground water, if any, can be measured. There is no dispute that Petitioner came into essential compliance with the law in December of 1979, when it connected its operations to the Middlesex County Sewerage Authority system, and its discharges began to flow into and be processed through that system. The Agency's position, however, is that if the facts are as it asserts, the

Attachment N-1

potential hazards from prior unpermitted discharge
a monitoring well program to assess the prior impact and to plan

penalty, but
effort.

Petitioner did not entirely deny its responsibility for the pollution found by the Agency. It asserted as its major defenses however, that at least some of the responsibility lay elsewhere and that the Division's testing procedures were not entirely satisfactory and, thus presumably for both reasons, it ought not to be put to the expense of installing a monitoring well system, nor should it be required to pay the full \$5,000 penalty.

Petitioner made a number of preliminary legal arguments in opposition to that part of the Agency's order requiring monitoring wells. These positions are independent of any factual development of the case and if founded would be generally dispositive of that part of the matter in this forum. These arguments are treated here initially under Part I of the opinion.

I

The monitoring well requirement is set forth at paragraph 17 of the Division's order as follows:

Within sixty (60) days of receipt of this Order, Hummel Chemical shall obtain the Division's approval of a plan for the installation of monitoring wells to determine the extent of ground water contamination beneath the Hummel Chemical site caused by the aforesaid discharges, install wells in accordance with the approved plan, collect ground water samples from said wells, have said samples analyzed by a qualified laboratory for all chemical substances that have been used and produced by Hummel Chemical at said site, and submit the results of said analysis to the Division. Hummel Chemical shall provide the Division with access to said wells for sampling and shall further provide the Division with adequate notice to allow the Division to collect duplicate samples at all times that Hummel Chemical samples said wells.

Petitioner's opposition to the monitoring well requirement rests on two basic arguments. Firstly, it argues that the Agency is without authority to impose such a requirement both because enforcement provisions of the Water Pollution Control Act, supra, do not authorize it, nor could it as this amounts to injunctive relief, available only through the courts. Secondly, and in the alternative it urges, that in failing to adopt some

Following the chemical analysis of these discharges, a letter was sent to Petitioner on February 24, 1977 informing it that it was operating without required permits, under the Permit to Locate Program, N.J.S.A. 58:10-17, et seq., see note 1, and that plans and specifications must be filed within thirty days of receipt of the letter. Mr. Maack testified that Petitioner through its attorney Richard Ragsdale, first contacted him on April 4, 1977 requesting a waiver from permit requirements, if Petitioner agreed to tie into the Middlesex County sanitary sewer system. Mr. Maack testified that he informed Mr. Ragsdale that such a waiver could be obtained if Petitioner did actually tie into the sewer system. However, as of September 24, 1979, the date the administrative order was issued, Petitioner had not made the necessary connections. The sewer connection was not completed until December of 1979.

Mr. Maack testified that in the spring of 1979 the Agency received a complaint concerning unpermitted discharges into a tributary of Bound Brook in the area of Petitioner's site and on June 20, 1979 inspectors were sent to the site. Photographs admitted into evidence (A-10c, A-10h) show a watercourse behind Petitioner's property, described by the Agency as a tributary and by Petitioner as a ditch. There was no dispute however, that this watercourse originated along Petitioner's common border with Steel Deck, in all likelihood being fed by storm water runoff from Steel Deck's warehouse building, and by ground water. It then curved behind Petitioner's property, making its way to Bound Brook and eventually to the waters of the Raritan. Mr. Maack testified that a water sampling was taken in the tributary at the point of a discharge pipe, which though not on Petitioner's property, was thought to be a discharge point for its chemical pollutants. He described the results of the laboratory analysis generally as being highly polluted. These contained lead at a level of 2.5 ppm (fifty times greater than permitted in surface waters, N.J.A.C. 7:9-4.4(a)(18)(ii)), concentrations of pesticides (which are considered hazardous, N.J.A.C. 7:14-8.3, and for which there is no acceptable minimum level, N.J.A.C. 7:9-4.6(c)(2)(ii)), ammonia at 181 ppm (considered hazardous, N.J.A.C. 7:1E-1.3, Appendix B, and for which there is no minimally acceptable level in surface waters, N.J.S.A. 7:9-4.6(c)(2)(ii)), COD at 609 ppm (acceptable range 20-40 ppm, supra), and 167 ppm of BOD (for which a 90% treatment reduction is required before it may be discharged, N.J.A.C. 7:9-8.29).

After receiving the report of his inspector at the scene Mr. Daniel Cutugno, and the laboratory analysis of that day, Mr. Maack dispatched Mr. Cutugno and Mr. Charles Johnson on July 18, 1979 to conduct further investigations at Petitioner's site.

Mr. Johnson then testified that on July 18, 1979, he observed the various processing operations taking place throughout the main building. He described Petitioner's milling and drying room operations. He testified that much dust and powder were in the air and on the floor as a result of Petitioner's milling operations, and this was washed down and pumped out of the building into an unlined ditch to the west of Petitioner's property, just across the Conrail tracks, and running approximately the length of Petitioner's main building. He also testified that he inspected the drying room where he saw a yellow powdered substance on the walls, on the floor and on the dryers. This material was also washed down and pumped out of the building. This wash down was directed to a pit behind the main building, from where it made its way through a pipe, shown on Petitioner's plans (A-1), to the southern end of Petitioner's property, and off the property to the discharge pipe leading into the tributary to Bound Brook where the June 20, 1979 sampling had taken place. He also testified that he observed a general area where this yellow powder was being spilled on the ground behind the main building.

Mr. Johnson testified also concerning two underground holding tanks located in the back of Petitioner's storage building. He testified that Dr. Schoen had explained to him that these again were for floor washdown and for any spills occurring in the storage building. The material would be stored in these tanks and then was supposed to settle out.

Mr. Johnson then inspected the discharge pipe, where Mr. Cutugno had taken his June 20, 1979 sample. On this date, however, he testified that a grayish-white liquid was flowing out of the pipe at an approximate rate of "one-tenth of the flow of the entire tributary." He testified that there was dead vegetation along the banks both upstream and downstream of the discharge and a grayish-white sediment lined the entire tributary.

Three laboratory samples were taken during the July 18, 1979 inspection (A-101). Sample C00304, taken from the drainage ditch running parallel to Petitioner's main building, indicated the presence of sodium at a level of 78.0 ppm, cyanide at .184 ppm (approaches the 0.2 ppm standard, 44 F.R. 43666, July 25, 1979), BOD at 63 ppm (for which a 90% outside reduction is required, supra), nitrates at 44 ppm (10 ppm is the standard, N.J.A.C. 7:10-5.1, 40 C.F.R. 141.11(b)), and ammonia at 1.3 ppm (no acceptable level, supra). Sample C-00307 was, according to Mr. Johnson taken from water directly in front of the discharge pipe in the tributary leading to Bound Brook. It contained COD at 269 ppm (acceptable range 20-40 ppm, see supra), BOD at 171 ppm (90% reduction required, supra), potassium at 475 ppm (no acceptable minimum level), calcium at

10 24

129 ppm (no acceptable minimal level), total dissolved solids (TDS) at 4168 ppm (maximum level 500 ppm, N.J.A.C. 7:10-7.2(a)(2)) and nitrate 17.6 ppm. Sample C00310 was taken from the holding tanks behind Petitioner's storage building. It showed COD at 172 ppm (acceptable range 20-40 ppm, see supra), TDS at 1787 (maximum 500 ppm, supra), BOD 165 ppm (90% reduction required, see supra).

He characterized many of these concentrations as extremely high and either not generally occurring in surface waters, or not occurring at these levels.

Mr. Daniel Cutugno was called to clarify some of the testimony originally presented by Charles Maack who testified concerning the June 20, 1979 inspection from reports and conversations with Mr. Cutugno. He explained the procedures used in taking the June 20, 1979 samples, and how they were each preserved and maintained prior to delivery to the State Laboratory for analysis.

Mr. Cutugno also testified that a whitish-gray material up and down the tributary in the area of the discharge pipe had a strong smell of ammonia, that all the vegetation alongside the tributary in the area of the discharge pipe was dead, and that generally the condition of the tributary was "very bad." He testified that initially he had visited the area in response to a complaint against Petitioner's neighbor Ortho, however, his investigation led him to Petitioner.

The Agency next presented Mr. William F. Althoff, a geologist, in charge of ground water pollution analysis in the Bureau of Ground Water Management. His testimony was directed to the monitoring well requirement in the Division's order. He testified firstly as to the general geology of the area, which he described as being made up to a depth of some fifty feet of stratified drift material which was poorly sorted, and thus, highly porous and permeable. He indicated that the water table was relatively high, and given the levels of chemicals and physical materials revealed by the laboratory analysis, there was reason to worry that there had been ground water pollution. He testified that while surface water analysis was fairly straightforward, measuring impact on a ground water reservoir was more difficult and required underground monitoring devices.

Petitioner presented its position through the testimony of Dr. Bernard Schoen, a Company Vice-President, and Dr. Alfred M. Hirsch, a consulting geologist. Dr. Schoen

testified that Petitioner has never bought, stored, sold or dealt with DDT, DDD or DDE. Dr. Schoen testified that all of the conduits which had formally carried effluent to the various ditches, pits and pipes, on and around the property, had either been broken up or plugged when Petitioner connected its facility to the Middlesex County Sewer System.

He also testified that Petitioner had been diligent in attempting to obtain State and local approval for its sewer connection, but that because of delays in the approval process and delays as well with its contractors, much time was lost. It was stipulated that on April 4, 1977 Mr. Ragsdale representing Petitioner telephoned the Agency concerning a waiver from permit requirements, and the possibility of installing a sanitary sewer connection; that on May 6 Mr. Ragsdale informed the Agency that engineers had been retained to prepare plans; that on August 18, 1977 Mr. Ragsdale informed the Agency that these plans had been submitted; that these were approved on August 30, 1977 by the Borough of South Plainfield; that the Agency received an application for its approval on December 2, 1977, and approved the extension on February 16, 1978; and that a construction contract between Petitioner and Oak-lane Plumbing and Heating, Inc. was received on March 14, 1979, the contract date being indicated as March 8, 1979.

Dr. Alfred Hirsch testified that he inspected the site on May 6, 1980 and again on May 12, 1980. Dr. Hirsch agreed essentially with Mr. Althoff's assessment of the geology and water table in the area. He presented photographs (P-2 through P-18) showing the close proximity of Petitioner's neighbor's Ortho, and Steel Deck to Hummel and the tributary to Bound Brook. He saw this situation as allowing easy opportunity for polluted runoff and possibly other chemicals from either of these companies to mix with Petitioner's and make their way into the tributary.

It was his view generally that while the sampling results from the tributary indicated a possible problem, the data was insufficient to isolate and distinguish Petitioner's contribution from that of its neighbors. In his view, the pollutants found in the tributary might have been the result of surface runoff, ground water pollution, flow from the discharge pipes, from dumping, or from other causes which the testing did not isolate. He indicated that the general area seemed to be a dumping ground for garbage and the like and as such, Hummel might be one of many polluters.

He criticized various elements of the Agency's testing program, most particularly he thought more testing up and down stream of the discharge pipe was necessary to isolate the pollution's sources. With respect to Mr. Johnson's testimony concerning his estimate of the relationship of the flow from the discharge pipe to the tributary, Dr. Hirsch believed that only precise testing could have disclosed the real flow on that day and he believed such could easily have been accomplished. Neither could he understand why the grayish-white material described by Mr. Johnson (A-10m, n and o) was not analyzed for content.

He testified on cross-examination that Hummel probably was responsible for much of the chloride, sodium, potassium and BOD in the tributary but that there might be others who contributed to this chemical content as well. He did agree that monitoring wells as a device would be very useful in determining ground water direction and rate as well as assisting in the determination of the source of the pollution.

I FIND the facts as follows:

1. Petitioner operated its chemical processing business without a required permit from the Agency, until December of 1979. At that time it completed a sewer connection linking its operations to the Middlesex County Sewerage Authority System, which temporarily waived its obligation to obtain a permit.
2. Petitioner received notice that it was operating without a permit on February 24, 1977.
3. On January 20, 1977 representatives of the Agency observed a large yellowish puddle in the snow on Petitioner's property, being fed by discharge from its main processing building. Laboratory analysis revealed a number of chemical and organic constituents in the discharge which either exceeded existing standards or for which there is no minimally acceptable level, or which are normally set through the permitting process.
4. Laboratory analysis of a water sample taken on June 20, 1979 in the vicinity of a discharge pipe into a tributary to Bound Brook, directly

behind Petitioner's site, and connected to its operations, disclosed a high level of pollution either exceeding existing standards or for which there is no minimally acceptable level, or which are normally set through the permitting process.

5. A comprehensive inspection of Petitioner's site conducted on July 18, 1979, recorded the following unpermitted discharges:
 - a. From the milling operations discharges were released into an unlined ditch running parallel with Petitioner's western border.
 - b. From the drying operations discharges were released to a pit behind the main processing building, and flowed through an underground pipe to the drainage ditch in the tributary to Bound Brook. Additionally, the drying operations caused a yellowish powder to be deposited in a general area behind the main processing building.
 - c. Wastes from Petitioner's storage room were directed into underground holding tanks from where they percolated into the ground.
6. Laboratory analysis of water samples taken on June 18, 1979, at the mouth of the drainage pipe behind Petitioner's property, at the end of the drainage ditch running parallel to Petitioner's main processing building, and from the holding tanks behind Petitioner's storage building, revealed high levels of pollution either exceeding existing standards or for which there are no minimally acceptable levels, or which are normally set through the permitting process.

There is no dispute and there can be no doubt that Petitioner's discharges of chemical and organic waste materials prior to December of 1979 were unpermitted, and were pollutants within the meaning of the Act, N.J.S.A. 58:10A-3. It is entirely responsible for those discharges which took place on its property, and it is at the very least a primary contributor to conditions in the drainage ditch running along its western border, and in the tributary to Bound Brook, behind its property. Piping leading from its operations feed directly into these areas.



Potential Hazardous Waste Site

Preliminary Assessment

Hummel Chemical Company, Inc.

10 Harmich Road

SO PLAINFIELD/ MIDDLESEX COUNTY



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION
01 STATE 02 SITE NUMBER

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site) Hummel Chemical Company, Inc.		02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER 10 Hqrmich Road			
03 CITY So. Plainfield	04 STATE NJ	05 ZIP CODE 07090	06 COUNTY Middlesex	07 COUNTY CODE	08 CONG DIST
09 COORDINATES LATITUDE 40° 34' 09" LONGITUDE 74° 23' 58"		Block 255 Lot 31			

10 DIRECTIONS TO SITE (Starting from nearest public road).
Take Rt. 27 north to 287 North; exit at Durham Ave(right) which turns into Hamilton Blv. Ave.
At approximately a 1/2 mile, take a right on Belmont Ave.; right onto the
First left onto Harmich Rd. proceed to the second building on the right.

III. RESPONSIBLE PARTIES

01 OWNER (if agency) B.F.Scheen, Sr., (Vice President) Hummel Chemical Company, Inc.		02 STREET (Business, Homeing, residential) P.O. Box 250			
03 CITY So. Plainfield	04 STATE NJ	05 ZIP CODE 07080	06 TELEPHONE NUMBER 201 754-1800		
07 OPERATOR (If agency and different from owner) same		08 STREET (Business, Homeing, residential)			
09 CITY	10 STATE	11 ZIP CODE	12 TELEPHONE NUMBER ()		
13 TYPE OF OWNERSHIP (Check one) <input checked="" type="checkbox"/> A. PRIVATE <input type="checkbox"/> B. FEDERAL: _____ (Agency name) <input type="checkbox"/> C. STATE <input type="checkbox"/> D. COUNTY <input type="checkbox"/> E. MUNICIPAL <input type="checkbox"/> F. OTHER: _____ (Specify) <input type="checkbox"/> G. UNKNOWN					

14 OWNER/OPERATOR NOTIFICATION: ON FILE (Check all that apply)

☐ A. RCRA 3001 DATE RECEIVED: _____ MONTH DAY YEAR ☐ B. UNCONTROLLED WASTE SITE (RCRA 103 c) DATE RECEIVED: _____ MONTH DAY YEAR ☐ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION XX <input checked="" type="checkbox"/> YES DATE 12 / 8 / 81 <input type="checkbox"/> NO (ATTACHMENT A)		BY (Check all that apply) <input type="checkbox"/> A. EPA <input type="checkbox"/> B. EPA CONTRACTOR <input checked="" type="checkbox"/> C. STATE <input type="checkbox"/> D. OTHER CONTRACTOR <input type="checkbox"/> E. LOCAL HEALTH OFFICIAL <input type="checkbox"/> F. OTHER: _____ (Specify) CONTRACTOR NAME(S): _____			
02 SITE STATUS (Check one) <input checked="" type="checkbox"/> A. ACTIVE <input type="checkbox"/> B. INACTIVE <input type="checkbox"/> C. UNKNOWN		03 YEARS OF OPERATION 1966 Present <input type="checkbox"/> UNKNOWN BEGINNING YEAR ENDING YEAR			

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED

Heavy metal compounds, volatile organics, pesitcides and explosive substances.
Attachments A1 thru A4; D2 pag. 4,5.

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION

Past records of poor housekeeping practices involving hazardous substances:
1) Observed surface water and sediment cotamination from unauthorized discharges of pro waters.
2) Potential groundwater contamination from poor housekeeping practices and spills.

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium a check also complete Part 2 - Waste information and Part 3 - Description of Hazardous Conditions and Incidents) <input type="checkbox"/> A. HIGH (inspection required promptly) <input checked="" type="checkbox"/> B. MEDIUM (inspection required) <input type="checkbox"/> C. LOW (inspection on time available basis) <input type="checkbox"/> D. NONE (no further action needed complete current assessment form)			
--	--	--	--

VI. INFORMATION AVAILABLE FROM

01 CONTACT Paul Harvey		02 OF (Agency/Organization) NJDEP DWR Enforcement (Central Region)		03 TELEPHONE NUMBER 609 292-0626	
04 PERSON RESPONSIBLE FOR ASSESSMENT Anne De Cicco		05 AGENCY HSMA	06 ORGANIZATION NJDEP	07 TELEPHONE NUMBER 609 292-1210	08 DATE 7-24-84



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE 02 SITE NUMBER

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

☐ A SOLID
☒ B POWDER, FINES
☐ C SLUDGE
☐ D OTHER (Specify) _____
☐ E SLURRY
☒ F LIQUID
☐ G GAS

02 WASTE QUANTITY AT SITE

(Measure in whole numbers
Must be independent)

TONS _____

CUBIC YARDS _____

NO OF DRUMS 25

03 WASTE CHARACTERISTICS (Check all that apply)

☒ A TOXIC
☒ B CORROSIVE
☐ C RADIOACTIVE
☒ D PERSISTENT
☒ E SOLUBLE
☐ F INFECTIOUS
☒ G FLAMMABLE
☐ H IGNITABLE
☐ I HIGHLY VOLATILE
☒ J EXPLOSIVE
☒ K REACTIVE
☒ L INCOMPATIBLE
☐ M NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS			
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS	25	drums	1982 TSP Facility Annual Report
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently used CAS numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/ DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
OCC	2,4-Dinitrophenol	51-28-5	drums		
OCC	Hydrazine	302-01-2	drums or bags		
OCC	Hexachlorobenzene	118-74-1	" " "		
OCC	Hexachloroethane	67-72-1	" " "		
MES	Lead Nitrate	18256-98-4	" " "	Attachments:	
MES	Lead Dioxide	7439-92-1	" " "	A2,pg.3	
MES	Lead Chromate	18454-12-1	" " "	A3,pg.2	
MES	Barium Chr	7440-47-3	" " "		
MES	ZincOxide	7440-66-6	" " "		
MES	Cupric Oxide	7440-50-8	" " "		
MES	Antimony Trisulfide	7440-38-2	" " "		
OCC	Ammonium Oxalate	999	" " "		
MES	Lead Thiocynate	592-87-0	" " "		
SOL	Acetone	67-64-1	" " "		
OCC	Ethylene Glycol	107-21-1	" " "	Attachment:	
			" " "	A4	

V. FEEDSTOCKS (See Appendix for CAS numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (See Appendix for references, e.g., data files, sample analysis reports)

A1-1982 TSD Facility Annual Report; NJDEP DWM,Permits and Registration file.
A2-Industrial Survey Inspection Report, NJDEP Science and Research
A3-Industrial Survey Selected Substances Report-NJDEP Science and Research
A4-Chemical Inventory Report-State Dept. of Health,Occupational Health,Jerry Roseman



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

D1 STATE D2 SITE NUMBER

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

D1 PHYSICAL STATES (Check all that apply)

☐ A SOLID
☒ B POWDER, FINES
☐ C SLUDGE
☐ D OTHER _____
(Specify)

☐ E SLURRY
☒ F LIQUID
☐ G GAS

D2 WASTE QUANTITY AT SITE

(Measure of waste quantity must be provided)

TONS _____

CUBIC YARDS _____

NO OF DRUMS _____

D3 WASTE CHARACTERISTICS (Check all that apply)

☒ A TOXIC
☒ B CORROSIVE
☐ C RADIOACTIVE
☒ D PERSISTENT

☒ E SOLUBLE
☐ F INFECTIOUS
☒ G FLAMMABLE
☐ H IGNITABLE

☐ I HIGHLY VOLATILE
☒ J EXPLOSIVE
☒ K REACTIVE
☒ L INCOMPATIBLE
☐ M NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	D1 GROSS AMOUNT	D2 UNIT OF MEASURE	D3 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE			
SOL	SOLVENTS			
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for MES frequently used CAS numbers)

D1 CATEGORY	D2 SUBSTANCE NAME	D3 CAS NUMBER	D4 STORAGE/ DISPOSAL METHOD	D5 CONCENTRATION	D6 MEASURE OF CONCENTRATION
OCC	Ethylene Glycol	107-21-1			
MES	Arsenic (Paris Green)	7440-38-2			
OCC	Isopropanol	67-63-0			
SOL	Methanol	67-56-1			
ACD	Nitric Acid	7697-37-2	A4		
ACD	Oxalic Acid	144-62-7			
ACD	Rosin Acid	999			
BAS	Sodium Hydroxide	1310-73-2			
OCC	Toluene	108-88-3			
OCC	Methylene Chloride	75-09-2	found in sediment samples D2		
MES	Mercury	7439-97-6	"		
OCC	Resorcinol	108-46-3	A4		
MES	Cyanide	420-05-3	Slight amt. in monitoring well-C		
PES	PP-DDT	50-29-3	found in sediment samples D2		
PES	Chlordane	57-74-9			
PES	Dieldrin	60-57-1			

V. FEEDSTOCKS (See Appendix for CAS numbers)

CATEGORY	D1 FEEDSTOCK NAME	D2 CAS NUMBER	CATEGORY	D1 FEEDSTOCK NAME	D2 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (See Appendix for information on how to obtain data from monitoring well reports)

(See preceding page)



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT

PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE 02 SITE NUMBER

II. HAZARDOUS CONDITIONS AND INCIDENTS

01X A GROUNDWATER CONTAMINATION

03 POPULATION POTENTIALLY AFFECTED: 140,863*

02X OBSERVED (DATE 6/25/81)

04 NARRATIVE DESCRIPTION

☐ POTENTIAL

☐ ALLEGED

Slight amounts of volatile organics, heavy metals and pesticides have been observed in monitoring wells on site; primarily salts and nitrates were observed. Refer to Comments Section.

*Refer to comments section for calculations. Lab Analysis-Attachments C

01X E SURFACE WATER CONTAMINATION

0*

03 POPULATION POTENTIALLY AFFECTED

02X OBSERVED (DATE 6/24/79)

04 NARRATIVE DESCRIPTION

☐ POTENTIAL

☐ ALLEGED

Lead contamination observed in discharge to an on-site drainage ditch flowing to the Bound Brk. Attachments D and D1 pg. 3.

(Refer to Comments Section) Acetone, Ammonia and Cyanide contamination observed in same drainage ditch D1, pg. 1, 4.

01X C CONTAMINATION OF AIR

03 POPULATION POTENTIALLY AFFECTED: 15*

02 ☐ OBSERVED (DATE)

04 NARRATIVE DESCRIPTION

☒ POTENTIAL

☐ ALLEGED

Workplace air potentially contaminated

An occupational health inspection identified inhalation hazards from dusts and chemicals.

*Number of employees. Attachment E1 page 3

01X D FIRE/EXPLOSIVE CONDITIONS

15*

03 POPULATION POTENTIALLY AFFECTED

02X OBSERVED (DATE 12/1/81)

04 NARRATIVE DESCRIPTION

☐ POTENTIAL

☐ ALLEGED

(Additional accident dates cited in Past records of numerous fires and explosions at facility Attachment)

*Refer to number of employees. Attachments E and E1.

01X F DIRECT CONTACT

03 POPULATION POTENTIALLY AFFECTED

02 ☐ OBSERVED (DATE)

04 NARRATIVE DESCRIPTION

☐ POTENTIAL

☐ ALLEGED

01X F CONTAMINATION OF SOIL

2.5

03 AREA POTENTIALLY AFFECTED: (ACRES)

02X OBSERVED (DATE 11/14/79)

04 NARRATIVE DESCRIPTION

☐ POTENTIAL

☐ ALLEGED

Sediment samples from above mentioned drainage ditch observed to be contaminated with heavy metals (Mercury, Nickel, Lead, Copper, Arsenic, etc.) and pesticides (DDT, DDE, Dieldrin, BHC, Chlordane, among others) Attachment D2 pgs. 4, 5 and 7.; D1 pg. 3.

01X G DRINKING WATER CONTAMINATION

03 POPULATION POTENTIALLY AFFECTED

02 ☐ OBSERVED (DATE)

04 NARRATIVE DESCRIPTION

☐ POTENTIAL

☐ ALLEGED

01X H WORKER EXPOSURE/INJURY

15*

03 WORKERS POTENTIALLY AFFECTED

02 ☐ OBSERVED (DATE 12/1/81)

04 NARRATIVE DESCRIPTION

☐ POTENTIAL

☐ ALLEGED

Fire and explosion accidents with reported injury. Attachment E1 page 2.

An occupational health inspection identified inhalation hazards from dusts and chemicals. *Represents number of employees. E1 page 3.

01X I POPULATION EXPOSURE/INJURY

03 POPULATION POTENTIALLY AFFECTED

02 ☐ OBSERVED (DATE)

04 NARRATIVE DESCRIPTION

☐ POTENTIAL

☐ ALLEGED



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT

PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE 02 SITE NUMBER

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ☒ J. DAMAGE TO FLORA
04 NARRATIVE DESCRIPTION

02 ☒ OBSERVED (DATE: 6/26/79)

☐ POTENTIAL

☐ ALLEGED

Dead vegetation observed along drainage ditch(tributary)of Bound Brk.

Attachment F,pg. 10.

01 ☐ K. DAMAGE TO FAUNA
04 NARRATIVE DESCRIPTION (Include number(s) of species)

02 ☐ OBSERVED (DATE: _____)

☐ POTENTIAL

☐ ALLEGED

01 ☐ L. CONTAMINATION OF FOOD CHAIN
04 NARRATIVE DESCRIPTION

02 ☐ OBSERVED (DATE: _____)

☐ POTENTIAL

☐ ALLEGED

01 ☐ M. UNSTABLE CONTAINMENT OF WASTES
(leakage, rupture, shifting, settling, etc.)

02 ☐ OBSERVED (DATE: _____)

☐ POTENTIAL

☐ ALLEGED

03 POPULATION POTENTIALLY AFFECTED: _____

04 NARRATIVE DESCRIPTION

01 ☒ N. DAMAGE TO OFFSITE PROPERTY
04 NARRATIVE DESCRIPTION

02 ☐ OBSERVED (DATE: _____)

☒ POTENTIAL

☐ ALLEGED

Potential damage to off-site property from unpermitted, contaminated discharges, surface runoff from chemical spill areas and general poor housekeeping practices of hazardous substances.

Attachment: General Information

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs
04 NARRATIVE DESCRIPTION

02 ☐ OBSERVED (DATE: _____)

☐ POTENTIAL

☐ ALLEGED

01 ☒ P. ILLEGAL/UNAUTHORIZED DUMPING
04 NARRATIVE DESCRIPTION

02 ☒ OBSERVED (DATE: 7/18/79)

☐ POTENTIAL

☐ ALLEGED

Pqst history of unpermitted discharges. Attachment F, pg. 14.

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED: _____

IV. COMMENTS

Paul Harvey, of DWR Enforcement(Central) recommends that this case be closed based on the low impact this facility had on the groundwater.
Remedial action by Hummel Chem. Co.,Inc. is noted in Attachment G.

For the groundwater contamination section, the population calculations are on the following page

V. SOURCES OF INFORMATION (Cite specific references e.g., State law, company analysis, reports)

B - NJDEP DWH Enforcement (Central Region)

C3,C,D,F-NJDEP DWR,Central File.

E State Dept. of Health,Occupational Health Jerry Roseman-(984-1863)

C2-Edison Health Dept C 1 - Middlebrk Health Dept.

I. GROUNDWATER CONTAMINATION

Population Potentially affected:

A. Private Wells- South Plainfield = 78	ATTACHMENT C1
Edison = 149	ATTACHMENT C2
<u>227</u>	est private wells w/in 3 miles of Hummel Property

227 wells x 3.8 pop/well + 863 population
potentially affected

B. Municipal Water Supply:

-Middlesex Water Company has 2 sets of well fields within
3 miles of Hummel site. Both service approximately 70,000
people. ATTACHMENT C3

70,000x2 + 140,000 people

TOTAL POPULATION POTENTIALLY AFFECTED + 140,000
863
140,863

II. SURFACE WATER CONTAMINATION

Population potentially affected:

Three miles downstream there are approximately 15 homes adjacent
to the Bound Brook. There are no known surface water intakes along this
section of the Bound Brook. (USGS Quad-Topo. map Plainfield)

STATE OF NEW JERSEY
DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT

DIVISION OF WATER POLICY
AND SUPPLY



SPECIAL REPORT NO. 28

GROUND-WATER RESOURCES OF
ESSEX COUNTY, NEW JERSEY

Prepared in cooperation with
United States Department of the Interior
Geological Survey

1968

Attachment F-1

volume of void to the total volume of unconsolidated sediment is considerably greater than the ratio of the volume of fracture openings to the total volume of rock. The interstitial openings in clays and silts are so small, however, that they restrict the movement of water, even though the percentage of void space may be great.

WATER-BEARING PROPERTIES OF MAJOR GEOLOGIC UNITS

Consolidated Rocks

Rocks of the Brunswick Formation are the main source of ground water in Essex County. The shales and sandstones are generally capable of sustaining moderate to large yields to wells. The Watchung basalt commonly is capable of yielding only small to moderate quantities of water.

Water in these rocks occurs under both unconfined and confined conditions. Unconfined ground water occurs mainly in the upland areas where overlying unconsolidated deposits are thin or absent. Confined and semi-confined ground water conditions exist in lowland areas in Newark, parts of Fairfield, and along the Passaic River where clay beds in the unconsolidated Quaternary deposits mantle the underlying rocks. Wherever such confinement occurs, water beneath the relatively impermeable confining layers is commonly under artesian pressure. In many areas, such as parts of Fairfield and in the northern part of the county, water in wells tapping the confined aquifers will rise above the top of the aquifer and sometimes near or above land surface. In areas subjected to heavy pumping, such as the Newark area and western Millburn Township, the artesian pressure may be considerably reduced. Parts of the confined aquifer may even become dewatered as has happened in part of Newark, in which case the water remaining in the aquifer is no longer confined.

Confined ground water is also encountered in the shales and sandstone directly beneath the basalt flows in the western part of the county down-tilt from the outcrop area. Confined or semiconfined ground-water conditions may occur in some areas because of differences in permeability within the rock layers resulting from variations in fracturing or weathering or a combination of both.

Some of the various systems of joints and fractures in the consolidated rocks intersect so that water can move vertically as well as horizontally and zones of high secondary porosity are then interconnected. Most wells tapping these rocks draw water from more than one water-bearing zone. However, these zones in the Brunswick Formation have not yet been accurately defined. They are certainly within the first 600 feet below land surface, and for most practical purposes are probably within the first 400 feet. The best producing wells in the Brunswick Formation in

Essex County are for the most part between 300 and 400 feet deep. Nevertheless, the lack of any precise known boundaries makes it difficult to determine the optimum depth to which a well should be drilled in any given location. Also it is impossible to predict the yield of a proposed well except in very general terms based on the average yield of other wells in the area.

Two pumping tests, both at the same locality, were conducted by the U. S. Geological Survey in January 1949 on wells tapping the Brunswick Formation in Essex County. The wells (owned by P. Ballantine and Sons, Newark), shown on figure 5, were selected to provide the best possible spread of observation wells in as many directions as possible. As the results of the tests have been reported by Herpers and Barksdale (1951, p. 28-31) they will be only summarized here.

In the first test, the centrally located well I-1 was pumped and water levels were observed in the seven surrounding wells indicated on figure 5. Well II-9 was pumped during the second test and the same wells were used to observe water levels. In both tests, observation wells lying along the strike of the Brunswick Formation with respect to the pumping well showed the greatest drawdown. When well I-1 was pumped, there was a prompt and distinct decline of the water level in observation well II-8. When well II-9 was pumped, the water level in observation well II-10 responded promptly and distinctly. No significant response was seen in observation wells aligned in directions other than along the strike during either test.

In these tests, as well as in several others conducted, it is invariably noted that aquifers in the sedimentary rocks of Triassic age of northern New Jersey are anisotropic, that is, they do not transmit water equally in all directions (Vecchioli, 1967). The greatest drawdowns are observed in those wells aligned along the strike of the sedimentary layers with respect to the pumping well. The least amount of drawdown is observed in observation wells that are located transverse to the strike. These observations have been interpreted to indicate that water moves more readily along joints and fractures which strike parallel to the strike of the bedding than along joints and fractures which strike in other directions. It is useful, when planning future well locations, to know the direction in which wells will interfere most with each other and with existing wells. In general, wells should be spaced far apart along the direction of strike (approximately N 30° E for most of Essex County) because it is in this direction that the greatest interference occurs. They may be placed closer together perpendicular to the strike since interference is less in that direction.

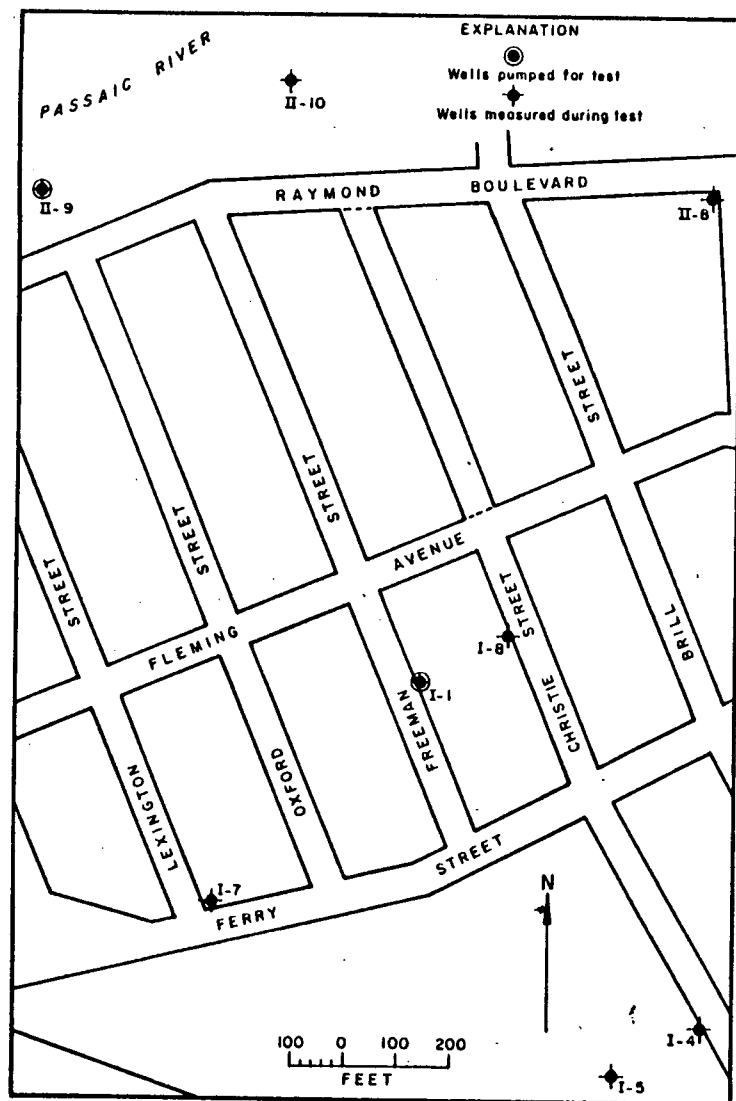


Figure 5.—Location of wells at plants of P. Ballantine and Sons, Newark, N. J., used during pumping tests in January 1949 (after Herpers and Barksdale, 1951, fig. 3, p. 30).

Well Yield and Specific Capacity

Yields of 35 large diameter public-supply, industrial, and commercial wells tapping the Brunswick Formation range from 35 to 820 gpm (gallons per minute) (Table 2) and average 364 gpm. The distribution of the yields is as follows:

Yields	No. of wells
0-150	4
151-300	12
301-500	12
>500	7

Depths of the same wells in the Brunswick Formation range from 115 to 856 feet; the average depth is 381 feet. Specific capacities of the 35 wells range from 0.21 to 70.00 gpm per foot of drawdown and average 11.07 gpm per foot of drawdown.

Wells tapping the Watchung Basalt commonly produce small to moderate quantities of water. Yields of 26 wells range from 7 to 400 gpm (Table 2) and average 116 gpm. The distribution of the yields is as follows:

Yields	No. of wells
0-100	15
100-199	5
200-300	5
>300	1

Specific capacities of wells in the basalt range from 0.05 to 5.66 gpm per foot of drawdown and average 1.74 gpm per foot of drawdown. Several moderate to high yielding public supply and industrial wells have been developed in the Essex Fells-West Caldwell-Fairfield area. These higher yields may be the result of increased fracturing of the basalt which has been slightly folded in this area.

Figures 6, 7, and 8 are specific capacity cumulative frequency distribution graphs for wells in the Brunswick Formation in Essex County. In figure 6, specific capacities are grouped on the basis of well depth. Wells drilled between 300 and 399 feet deep appear to have consistently higher specific capacities than wells of other depths (fig. 6). This relationship suggests that the best water-bearing zones in the Brunswick Formation will be

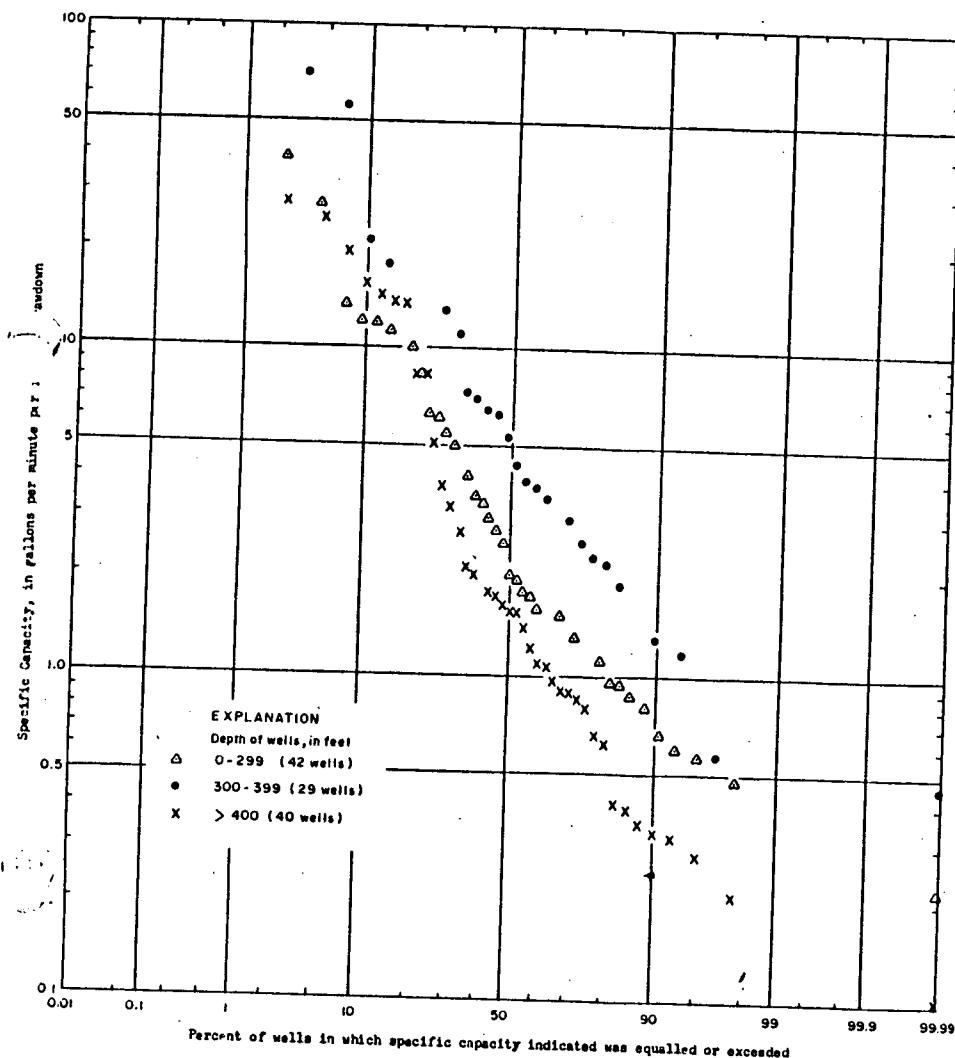


Figure 6.—Cumulative frequency distribution of specific capacities of wells penetrating the Brunswick Formation grouped according to depth.

encountered between depths of 300 and 400 feet and that significantly greater quantities of water generally will not be obtained by drilling below 400 feet. The specific capacities of wells grouped according to geographic area are shown in figure 7. These areas divide Essex County into three strips which are approximately parallel to the strike of the Brunswick Formation. The eastern strip is further divided into a northern part covering Belleville, Bloomfield, Glen Ridge, and Nutley, and a southern part covering East Orange, Irvington, and Newark. From this graph it readily can be seen that wells in Maplewood, Montclair, Orange, South Orange, and West Orange, have generally higher specific capacities than wells in other parts of Essex County. The wells in these communities are located in the area immediately east of First Watchung Mountain. In figure 8, specific capacities are related to well diameter. As should be expected, larger diameter wells have higher specific capacities.

Quality of Water

Except for hardness-forming constituents and local salt-water contamination, water from the Triassic rocks commonly does not contain objectional concentrations of any chemical constituents throughout most of the county (Table 3). The hardness of water ranges from 104 ppm (parts per million) to 273 ppm. In the Newark area, salt-water contamination has seriously impaired the quality of ground water and chloride concentration are as high as 1,900 ppm.

Ground water has high chloride concentrations in areas of relatively heavy pumpage in eastern Newark adjacent to Newark Bay and the Passaic River. By 1900, water levels in these areas, notably in the southeastern section, were considerably below sea level (fig. 9). The major pattern of ground-water development had changed slightly by 1960. More significant however is the extent to which water levels had been lowered below sea level and the increase in the size of the area affected by 1960 (fig. 10). Heavy ground-water withdrawals have lowered the general water level in these areas (fig. 10), reversing the natural gradient between the ground- and surface-water bodies, and have induced a flow of salt water from the river and bay into the underlying water-bearing formations. A water sample collected in 1879 from a well owned by the Celluloid Works, located in this part of Newark, contained only 6.2 ppm chloride. In 1948, water with 1,900 ppm chloride was collected from a well in the same area owned by P. Ballantine and Sons. A probable contributing factor in salt-water intrusion is the dredging of ship canals in Newark Bay and the Passaic River. In deepening these canals, semi-pervious Recent and Pleistocene sediments were removed which had acted as an imperfect barrier to the infiltration of salt water.

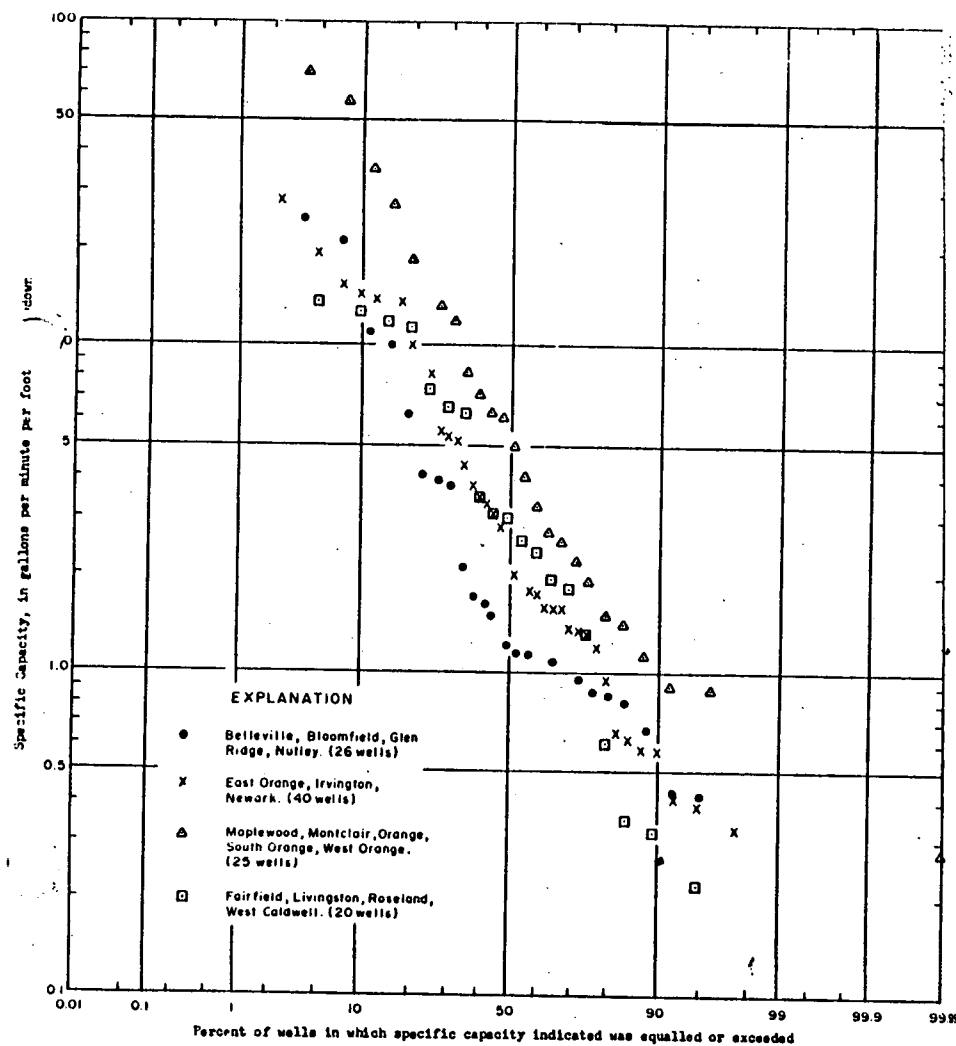


Figure 7.—Cumulative frequency distribution of specific capacities of wells penetrating the Brunswick Formation grouped according to geographic area.

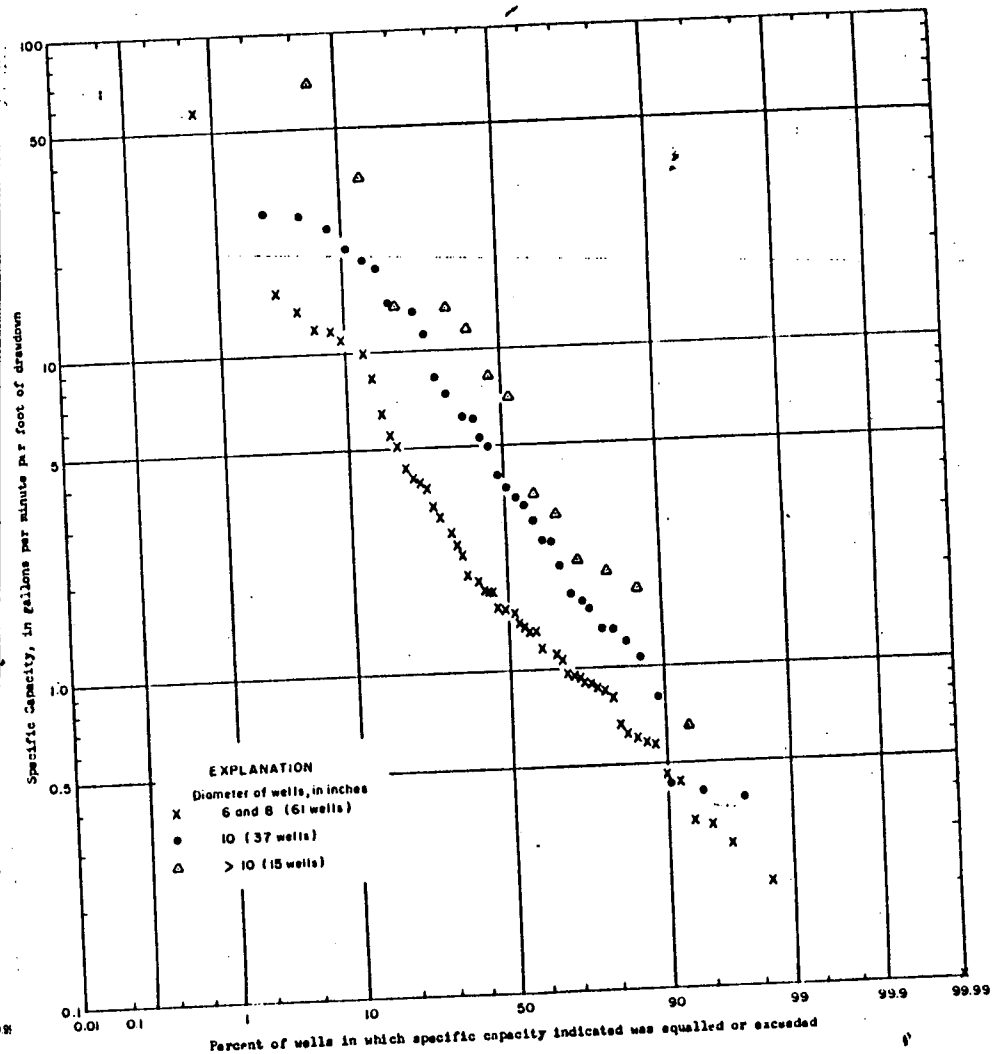


Figure 8.—Cumulative frequency distribution of specific capacities of wells penetrating the Brunswick Formation grouped according to well diameter.

P-5

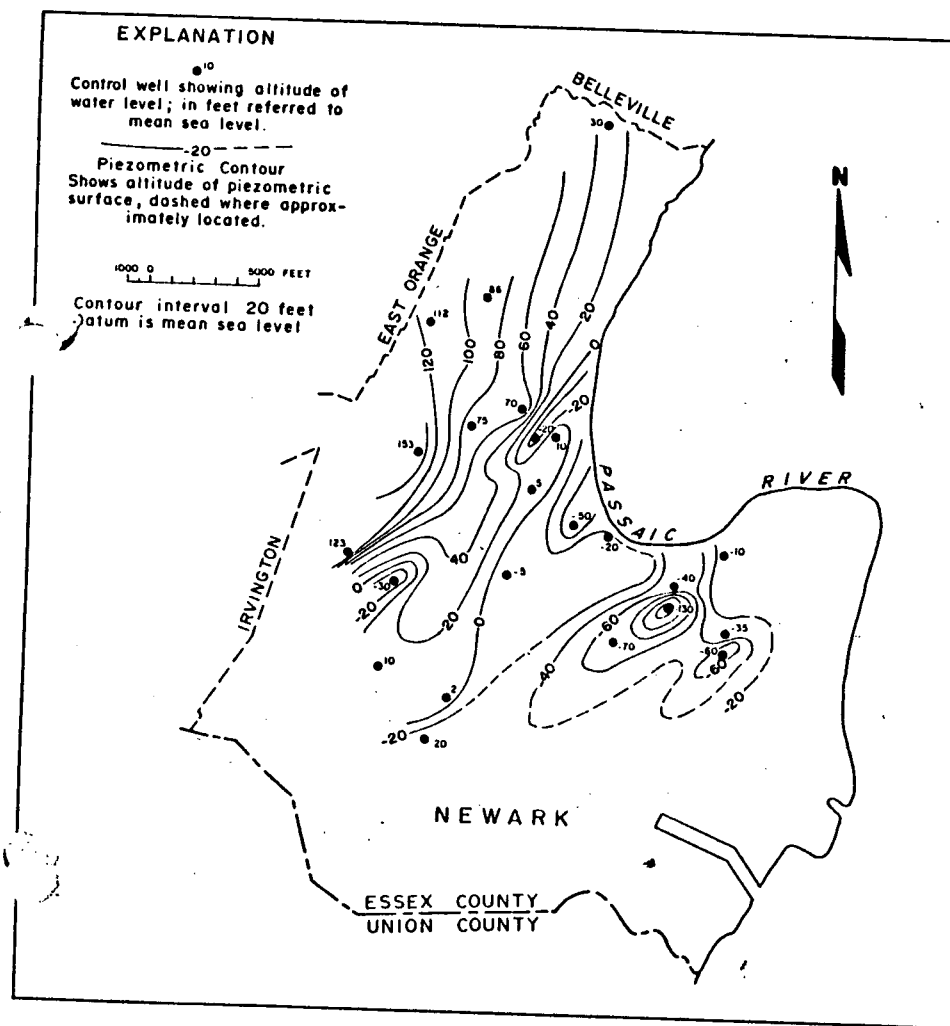


Figure 9.—Generalized piezometric contours for the Brunswick Formation in the Newark area based on water levels in wells drilled between 1890 and 1900.

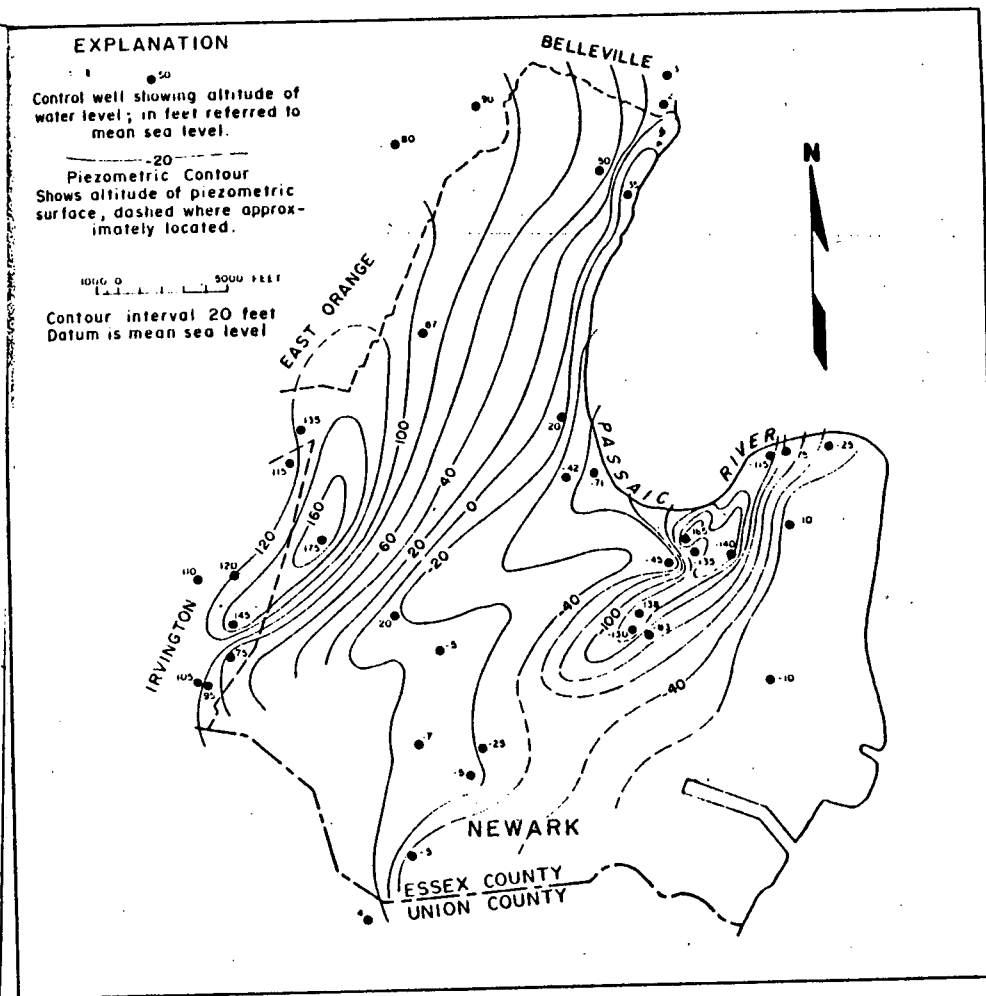


Figure 10.—Generalized piezometric contours for the Brunswick Formation in the Newark area based on water levels in wells drilled between 1950 and 1960.

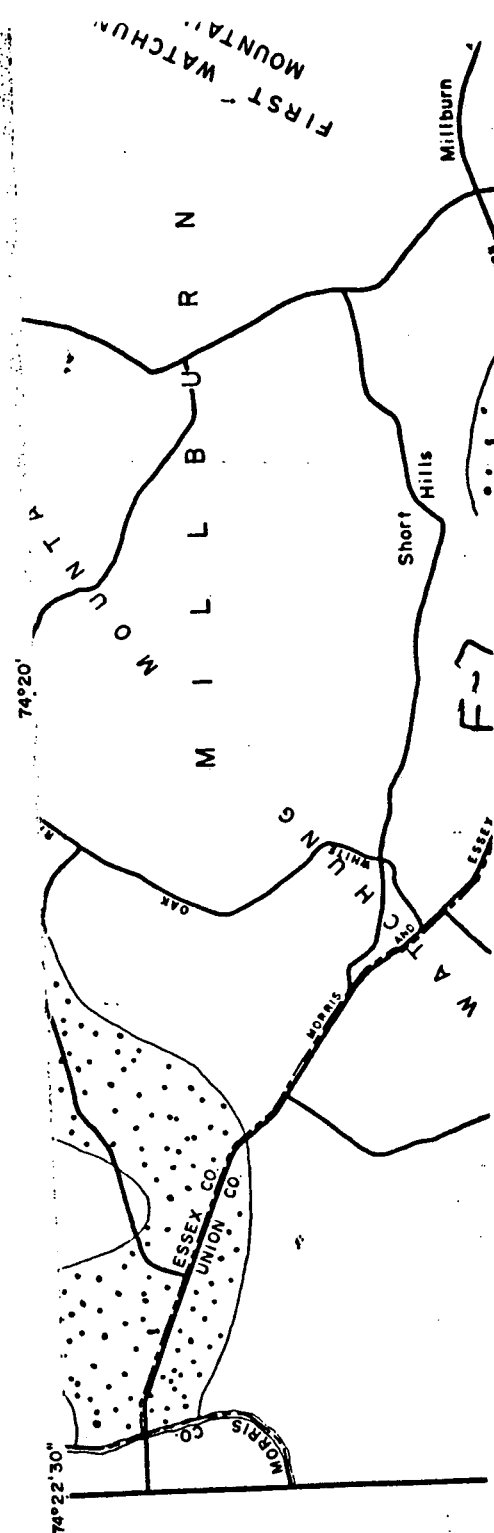
Salt-water contamination of the Brunswick Formation in the Newark area has been investigated by Herpers and Barksdale (1951). Their study was based on analyses of water samples collected in 1942 by the city of Newark. More recent analyses suggest there has been additional encroachment of saline water since 1942 throughout the problem area. In 1942, water from the Wilbur Driver Company's well No. 2 along the Passaic River in northern Newark contained 72 ppm chloride. In 1961, water from this same well contained 330 ppm chloride. Water from a well drilled by Mutual Benefit Life Insurance Company, 520 Broad Street, in 1965 contained 1,145 ppm chloride. Samples collected from other wells in this area contained less than 500 ppm chloride in 1942.

Pleistocene Deposits

Unconsolidated sediments of Pleistocene age mantle the bedrock throughout much of Essex County (fig. 3). They consist of clay, silt, sand, gravel, and boulders and can be divided into two general categories—stratified drift and unstratified drift. Only sand and gravel aquifers in stratified drift deposits contain sufficient quantities of water to warrant discussion of their water-bearing properties.

Water in the stratified drift occurs under both unconfined (water table) and confined (artesian) conditions. Unconfined ground water occurs where sand and gravel deposits are not covered by clay, silt, or glacial till and are exposed at the surface. The distribution of these deposits is shown on figure 3. For the most part however, these sand and gravel deposits do not yield large quantities of water as they are commonly less than 20 feet thick and are not areally extensive. The unconfined aquifers are recharged directly from precipitation on the outcrop area. Confined and semiconfined ground water occurs where sand and gravel deposits have been covered by lake clay or silt, or by glacial till. These deposits are largely confined to the buried valley so they are not visible on the surface and their regional extent and distribution are therefore not readily apparent. The confined and semiconfined aquifers are recharged by leakage through overlying confining beds and by precipitation falling on outcrop areas outside Essex County. Some recharge may also be derived from the underlying and adjacent Brunswick Formation.

The most productive artesian and semi-artesian aquifers in the stratified drift in Essex County occur as valley fill in stream valleys that were cut in the bedrock before the last glaciation. Consequently the size, shape, and distribution of the aquifers conform to the size, shape, and distribution of the bedrock valleys. The bedrock valley underlying the Newark area (shown on fig. 4) is filled with till and clay, and contains only minor amounts of water-bearing sand. Extensive subsurface exploration in western



Essex and eastern Morris Counties has demonstrated that the valley-fill aquifers in Essex County are part of an extensive valley-fill aquifer system underlying much of these two counties (Vecchioli and others, 1968). Figure 11 shows the known distribution of valley-fill aquifers in western Essex County.

The most highly developed part of the valley-fill aquifer system is in western Millburn and southwestern Livingston. Four well fields tapping the Pleistocene sand and gravel are located in an area of less than 4 square miles. During 1965 an average of 13.6 mgd (million gallons per day) was pumped from these fields. Such continued heavy development has, naturally, lowered water levels in the aquifer. In 1925, the depth to water in the Canoe Brook well field of Commonwealth Water Company was about 30 feet below land surface. By 1965, the average depth to water in the same field had dropped to 83.5 feet below land surface.

Figure 12 shows the annual mean depth to water in the Commonwealth Water Company's Canoe Brook well field for the 20-year period 1947 to 1966. The water level has declined almost continuously since 1947. This is due in large part to increased demands placed on the adjacent Canoe Brook well fields of the Commonwealth Water Co. and East Orange Water Dept. for most of the period 1947 to 1961. Commonwealth Water Company's Passaic River well field was put into service in 1956 and although the demands on their Canoe Brook field were lessened, the combined pumpage (not shown) continued to increase. However, in spite of the fact that from 1961 to 1966 pumpage from the Commonwealth and East Orange Canoe Brook fields decreased, the water level in the Commonwealth Canoe Brook field continued to decline (fig. 12). Several factors probably have caused this continuing lowering of water level. The Passaic River well field taps the same aquifer and withdrawals there have undoubtedly had some effect on area water levels. In addition, Commonwealth's Canoe Brook well field area has had below average rainfall for 12 of the 13 years since 1953 with a consequent reduction in the amount of available recharge. The reduction in recharge together with increased demands during extended dry periods, especially from 1961 to 1966, have contributed to the steady decline of the water level in the aquifer.

Aquifer tests on the stratified drift deposits have been conducted by the U. S. Geological Survey at two localities in Essex County and at several places in Morris County. The reliability of the results of these tests are questionable for the following reasons: (1) the aquifers are not areally extensive; (2) it is impossible to control or eliminate outside interference; (3) it is seldom possible to establish pre-test water-level

F-8

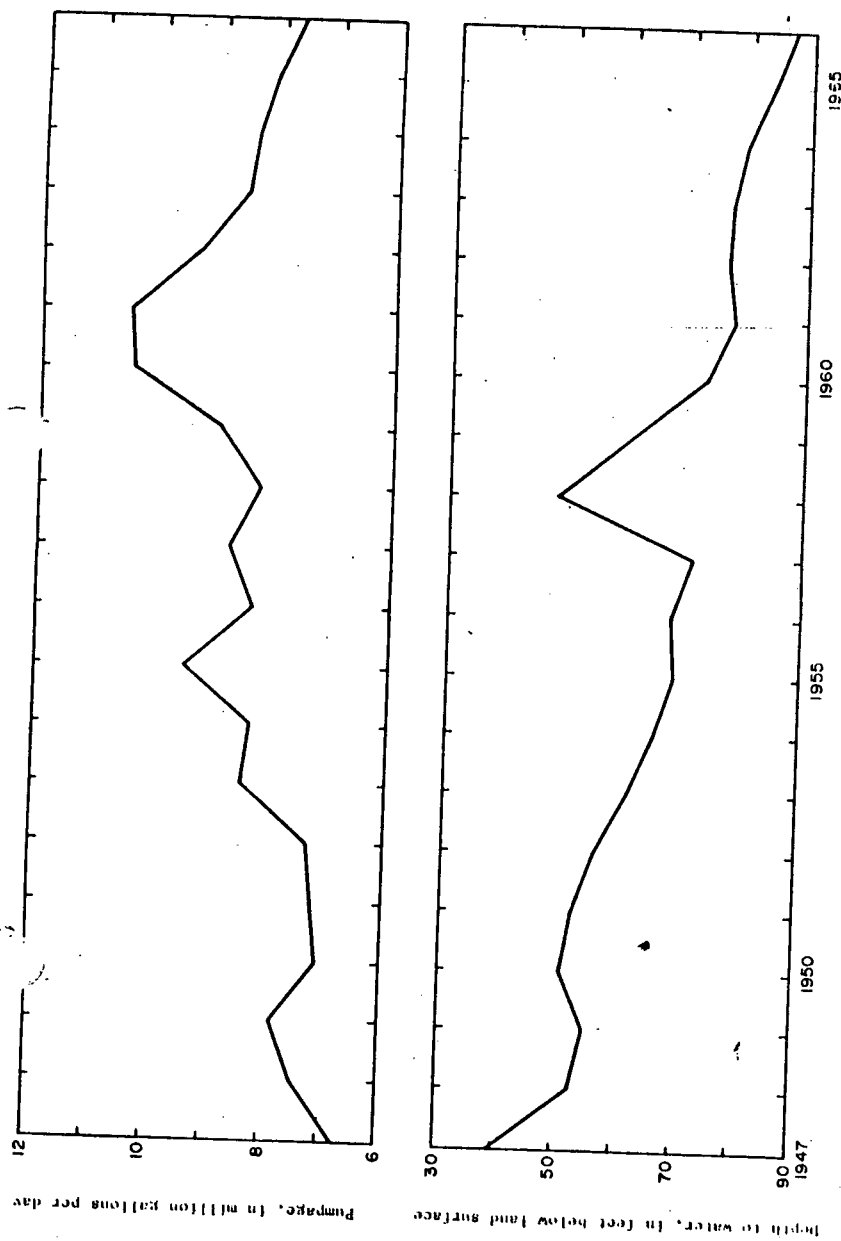


Figure 12.—Depth to water in the Commonwealth Water Company Canoe Brook well field and ground-water pumpage from the Commonwealth Water Company and East Orange Water Dept. Canoe Brook well field.

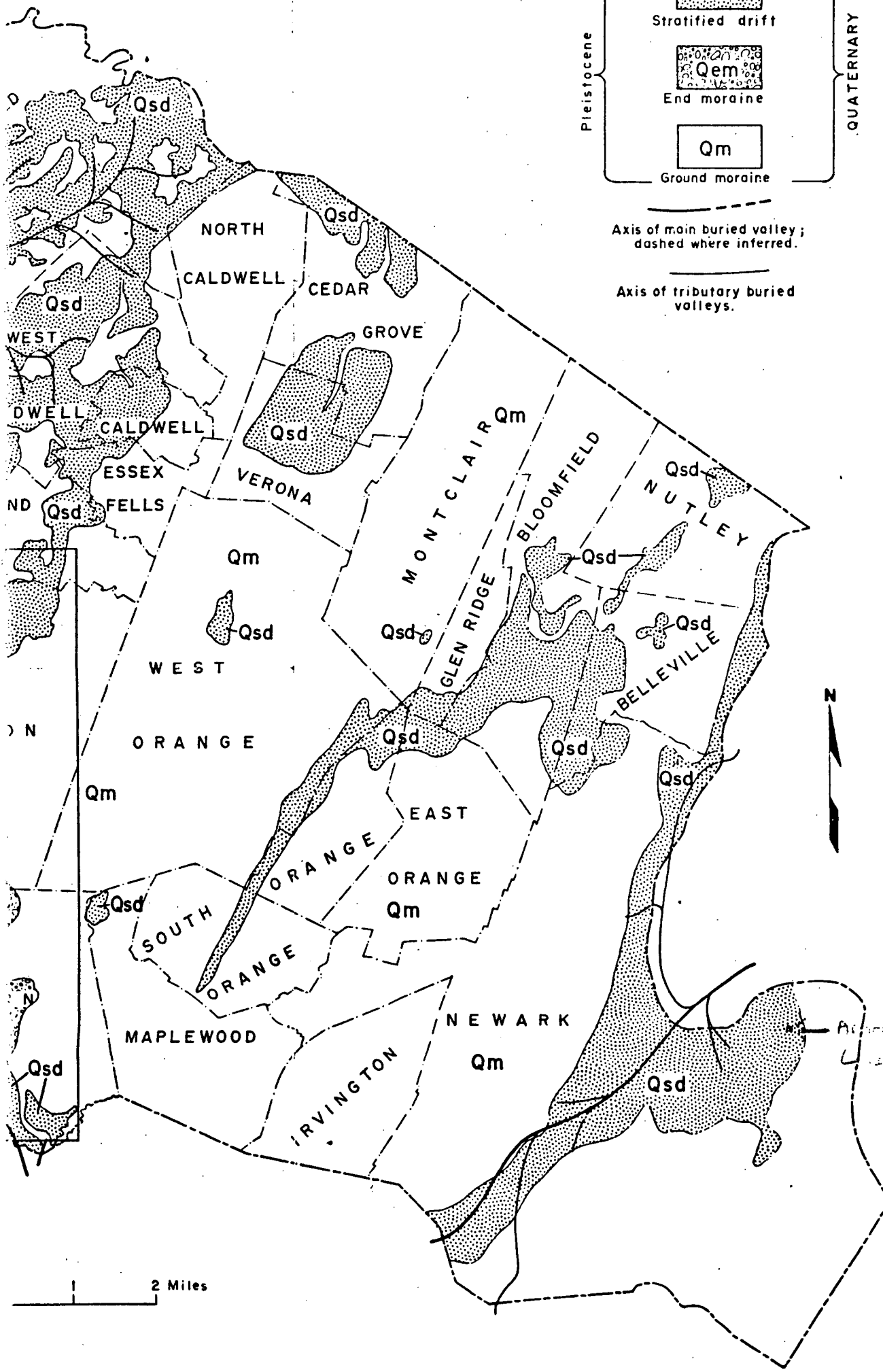
trends; and (4) observation wells commonly are insufficient in number or not properly located. It is therefore difficult to apply average figures for permeability, transmissivity, and the coefficient of storage to the valley fill aquifer and then use these figures to determine long-range effects of pumpage throughout the aquifer system. Each area must be evaluated in context with the numerous variables by which it is affected.

Stratified drift deposits are the most productive aquifers in Essex County. Yields of 27 large-diameter wells tapping these deposits range from 410 gpm to 1,593 gpm (table 2) and average 908 gpm. The distribution of the well yields is as follows:

<u>Yields</u>	<u>No. of wells</u>
<500-gpm	3
501- 800 gpm	11
801-1,200 gpm	9
>1,200 gpm	4

Water from the stratified drift deposits ranges in hardness from 104 ppm to 212 ppm (table 3). Most of the samples analyzed had sulfate concentrations of 40 ppm or less, chloride concentrations of less than 11 ppm, and nitrate concentrations of 3 ppm or less. However, water from one well in Essex Fells had chloride and nitrate concentrations of 28 ppm and 6.4 ppm, respectively, and water from two wells in Millburn had sulfate concentrations of 67 ppm and 77 ppm. The higher concentrations of these constituents suggests a low-grade pollution problem, probably resulting from either sewage or the use of chemical fertilizers in the area. Manganese concentrations slightly in excess of the Public Health Service's recommended maximum limit of 0.05 ppm occur locally in the Commonwealth well field.

29



Hummel Chemicals

PRELIMINARY ASSESSMENT FILE SEARCH

NJDEP

DIVISION OF WATER RESOURCES:

- A. Enforcement Metro - No File
- B. Groundwater Geologic Survey - No File
- C. Other Central File - No File

DIVISION OF WASTE MANAGEMENT:

- A. HSMA - PEERA - Anne DeCicco - No File
HSMA - Central File - No File
- B. Enforcement - metro - No File
- C. Solid Waste No File

ENVIRONMENTAL QUALITY:

- A. Air Pollution - No File
- B. Pesticides —
- C. Other —

DIVISION OF FISH AND GAME:

OFFICE OF SCIENCE AND RESEARCH:

- A. Industrial Survey —
- B. Other Ed Stevenson - Hummel considered a Class III dioxin site which have not been looked at.

N.J. DEPARTMENT OF HEALTH:

Nancy Hall - Occupational Health Program - 609/924-1863 - No File

LOCAL AUTHORITIES:

- A. Health Department Jack Farley - Suburban Regional Health Commission
Paul Butler - Newark Engineering - 201/733-7994 - No File
- B. Town or County Clerk

UNITED STATES GOVERNMENT:

- Newark F.D. - Chief Busini (201/733-7443) - no information - no one has been around long enough to remember Hummel's occupancy, but not much else.
- Newark F.D. - Mr. Monte (201/733-7441) - remembers Hummel Chemical was at factory site, not sure if documents are present
- A. EPA - Cincinnati - Mr. Wilmoth 513/569-7504
- B. Other - Forrest Dryden - 904/751-3733
worked on EPA's Dioxin book - cannot produce documents without extensive searching.
- Thomas Tiernan - 513-873-2202
Wright State Univ. - also worked on Dioxin Book - referred me to Forrest Dryden

HUMMEL CHEMICAL
185 FOUNDRY STREET
NEWARK, ESSEX COUNTY
EPA ID # NJD002174712

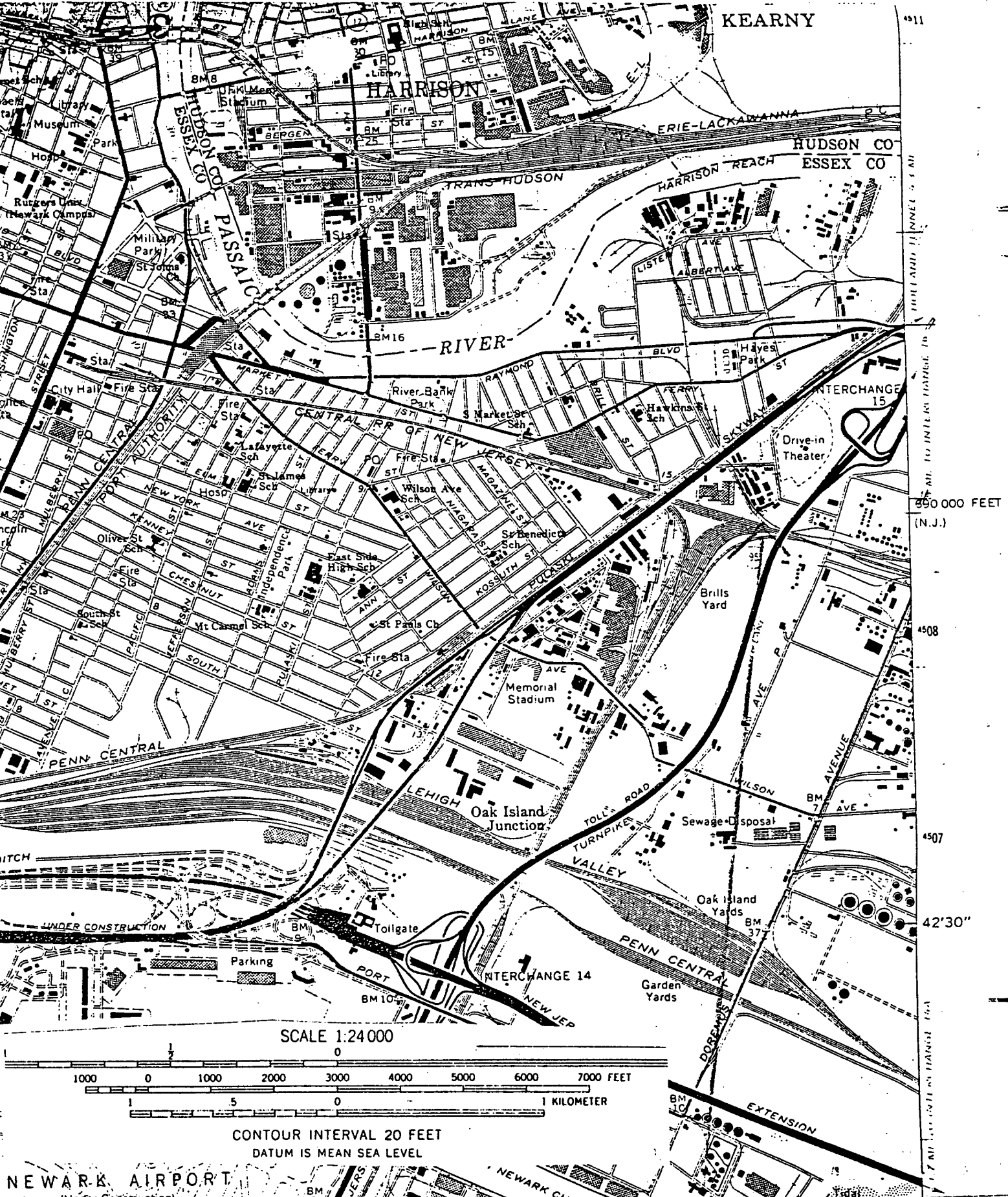
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5. NJ ATLAS BASE MAP
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7. WATER SUPPLY OVERLAY
8. WATER WITHDRAWAL MAP

ATTACHMENTS

- A. DATA SUMMARY FROM OCTOBER, 1988 SITE INSPECTION
- B. PRELIMINARY ASSESSMENT; SEPTEMBER 1987
- C. "DIOXINS", EPA, NOVEMBER, 1980
- D. MEMOS RE: HUMMEL ACTIVITIES IN THE PAST, 1987
- E. LETTER RE: HUMMEL, SOUTH PLAINFIELD; FEBRUARY 1982
- F. "GROUNDWATER RESOURCES OF ESSEX COUNTY", 1968
- G. MEMO RE: SAMPLING PLAN, OCTOBER 1988
- H. MEMO RE: SAMPLING EPISODE REPORT, OCTOBER 1988

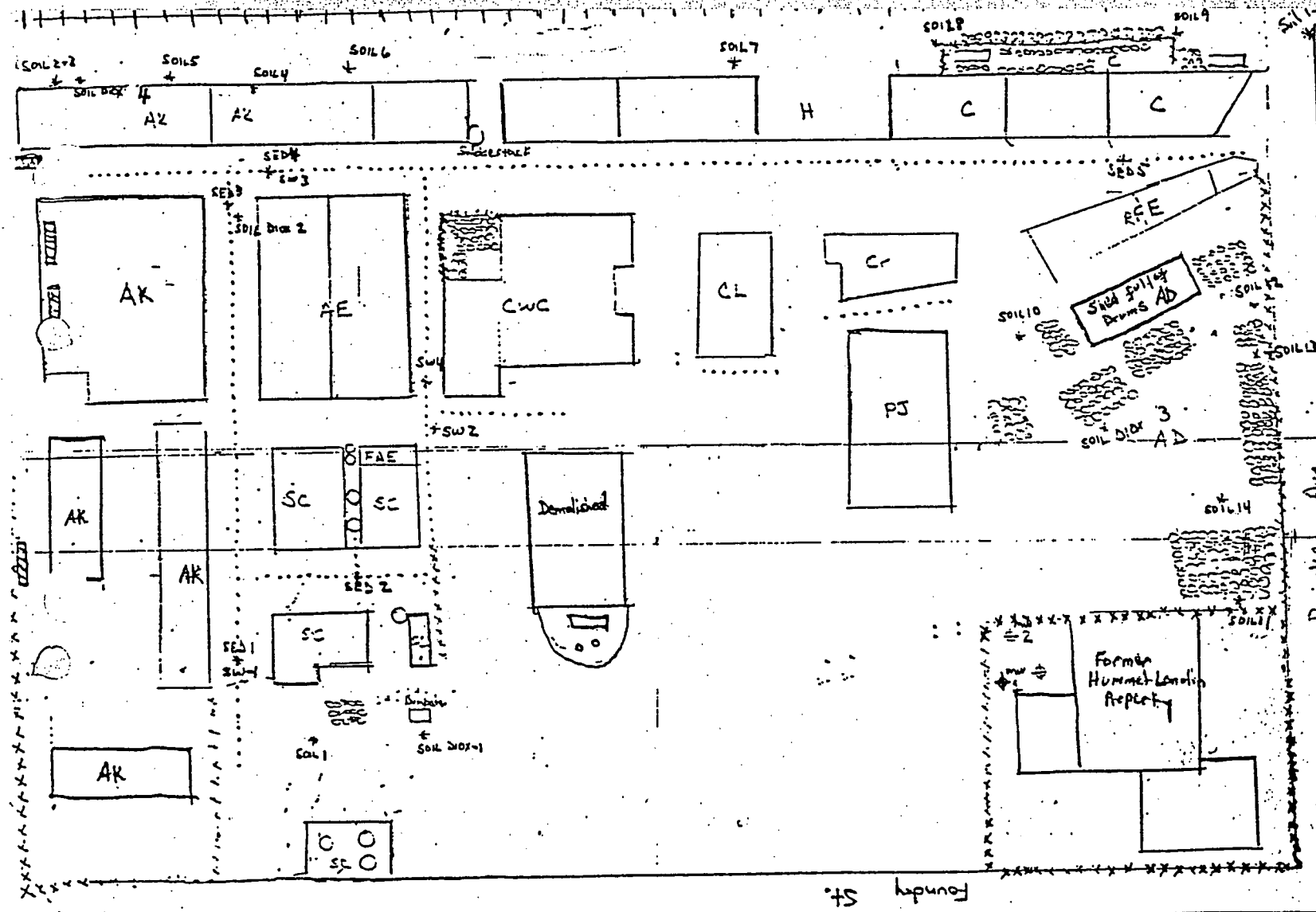


Hummel Chemical Co.
175 Foundry - St.
Newark, Essex County,
Latitude: $40^{\circ}43'34''$
Longitude: $74^{\circ}08'01''$
Map # 1

SITE
MAP
#2

KEY

- Drainage
- ===== Fenced areas
- ===== Drums
- ===== Trailers
- ===== Above Ground tanks horizontal
- ===== Above Ground tanks vertical
- + Sample locations
- + wells
- Arkansas Chemical - AK
- Automatic Electroplating - AE
- Avon Drum - AD
- Conus Chemical - C
- Coronet Chemical - Cr
- County Lift Truck - CL
- Fleet Auto Electric - FAE
- Honig Chemical - H
- PJ Express - PJ
- Refinery for Electronics - RFE
- Sun Chemical - SC



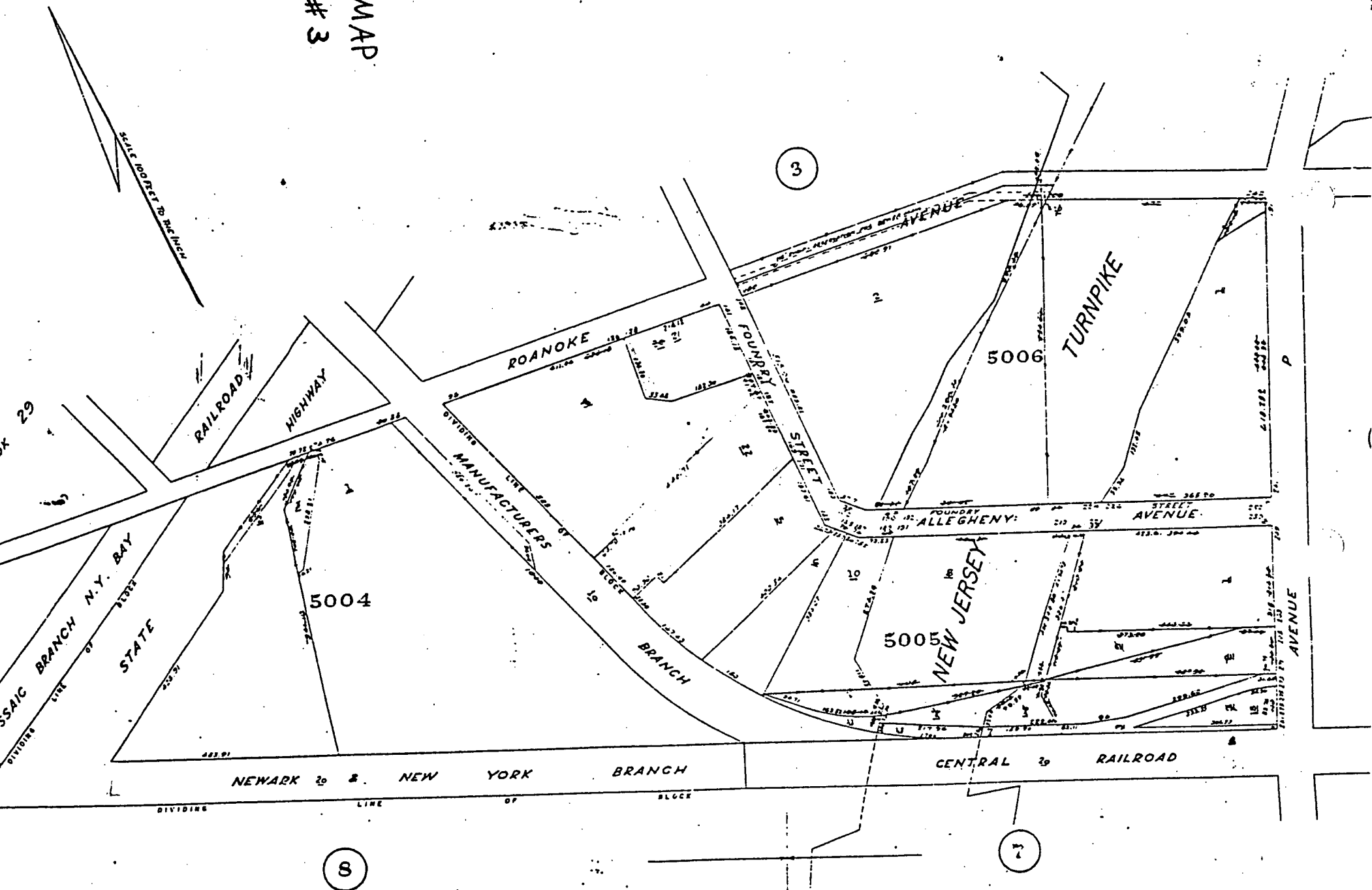
Hummel Chemical (AKA: 185 Foundry St. Site)

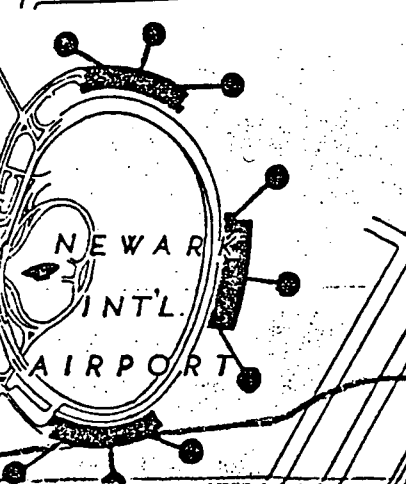
10/17/88

Robert K. Buehler

Not to Scale

TAX MAP
Map # 3





ESSEX COUNTY
ROAD MAP
Map # 4

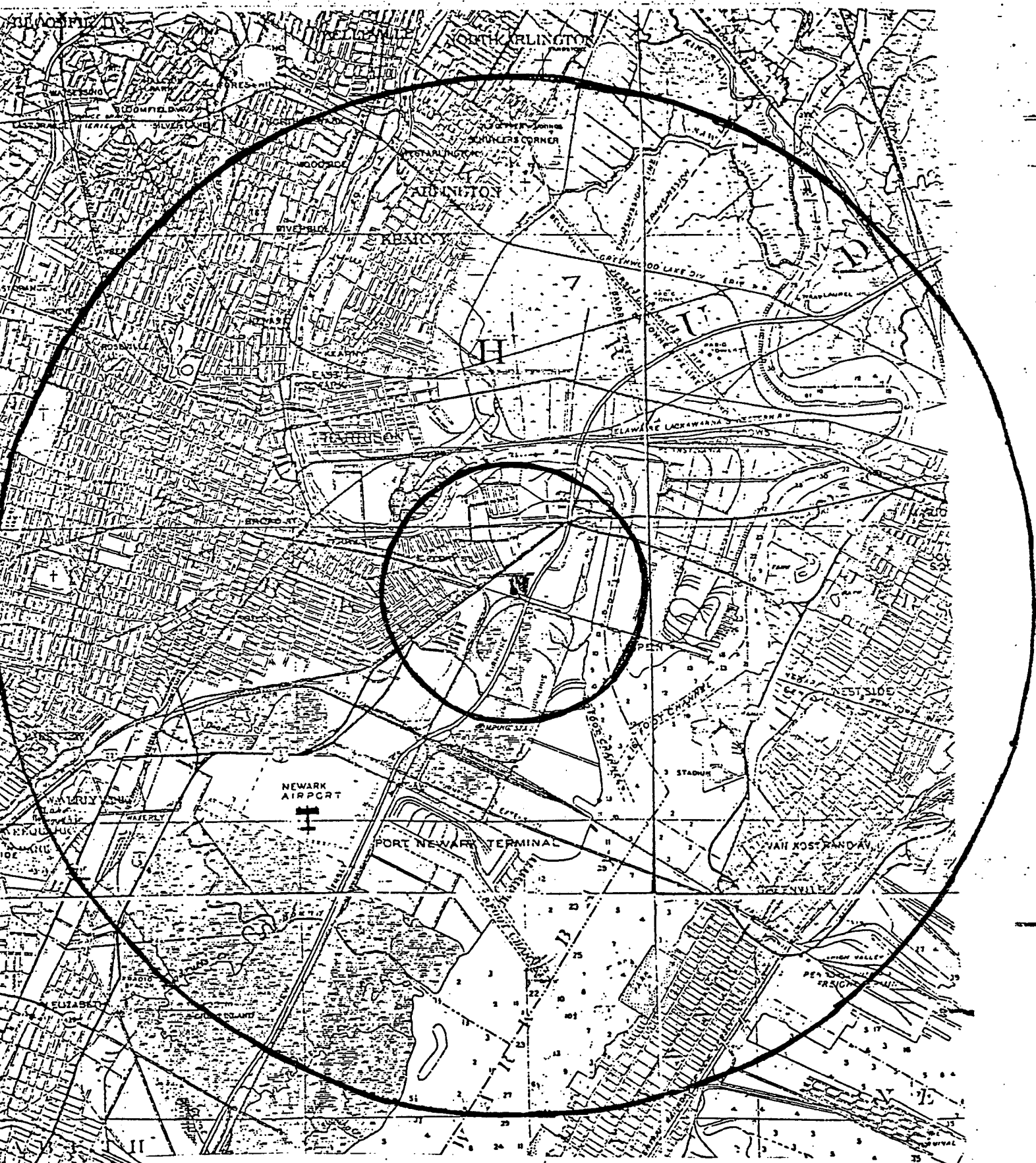
SCALE IN FEET (APPROX.)
1000 0 1000 2000 3000 4000 5000

SCALE IN METERS (APPROX.)
200 0 200 400 600 800 1000

PORT
NEWARK



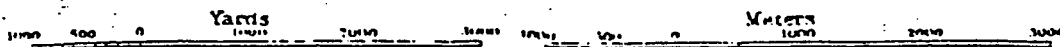
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11
12
13
14

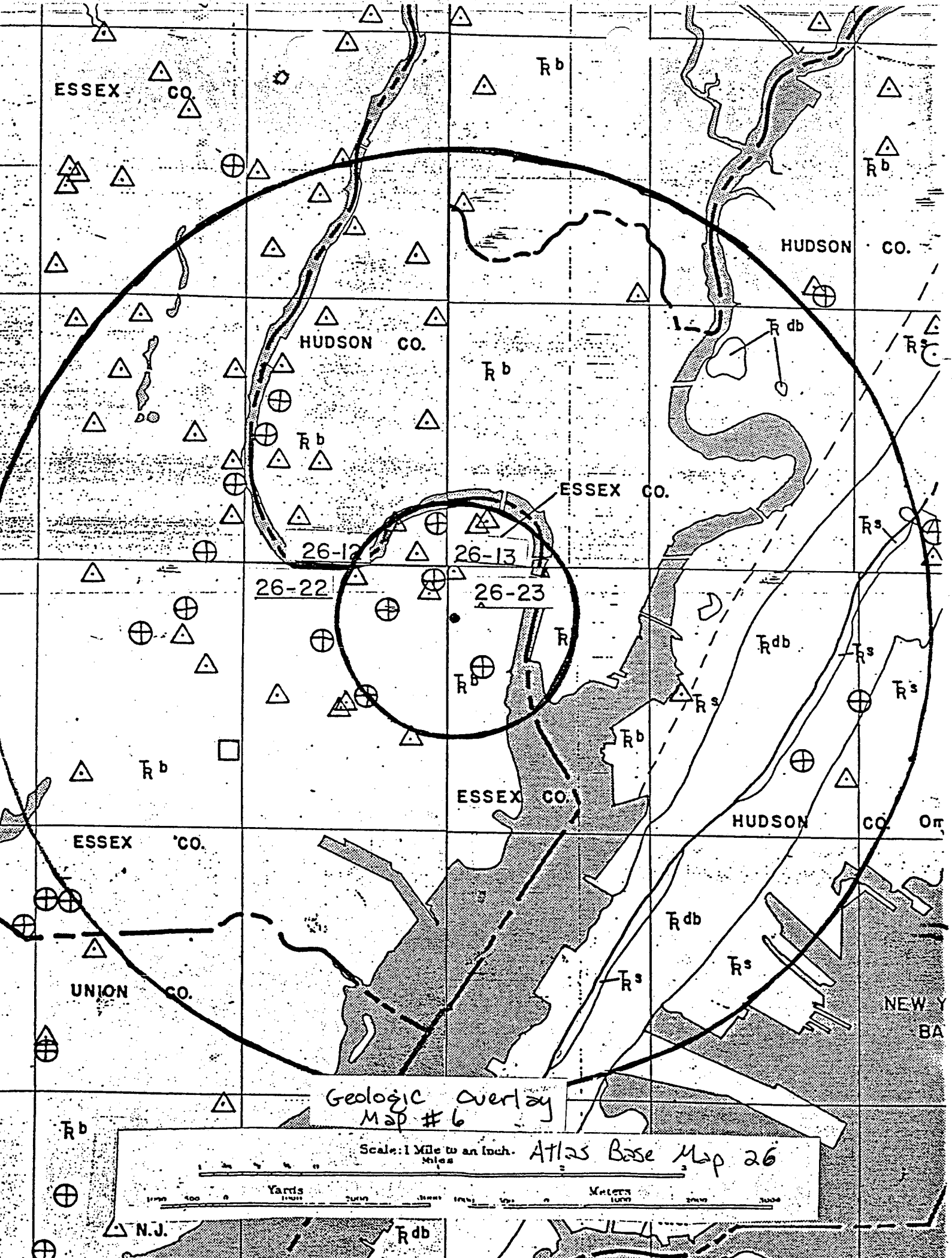


Map # 5

Scale: 1 Mile to an Inch.

Atlas Base Map 26





LEGEND OR ATLAS SHEET 26 GEOLOGY

- △ — INDUSTRIAL WELL YIELD OVER 70 GALLONS PER MINUTE (INCLUDING PRIVATE WELLS)
- — PUBLIC SUPPLY WELL YIELDING OVER 70 GALLONS PER MINUTE
- ⊕ — UNSUCCESSFUL ROCK WELL YIELDING LESS THAN 70 GALLONS PER MINUTE
- — UNSUCCESSFUL SAND WELL YIELDING LESS THAN 70 GALLONS PER MINUTE
- † — NO TEST — NO DATA ON YIELD

--- FAULT (DASHED WHERE INFERRED)

--- CONTACT (DASHED WHERE INFERRED)

--- PHYSIOGRAPHIC PROVINCE BOUNDARY

--- WATER SUPPLY TRANSMISSION LINE

NOTE: WHERE THE PRECAMBRIAN FORMATION BOUNDARIES TERMINATE ABRUPTLY, IT IS THE GEOLOGIST'S OPINION THAT THE GEOLOGICAL COMPLEXITY OF THE AREA PREVENTS FURTHER INTERPRETATIONS.

Kmr — CRETACEOUS MAGOTHY AND RARITAN FORMATIONS (SAND AND CLAY)

Tb — TRIASSIC BRUNSWICK FORMATION

Tc — TRIASSIC CONGLOMERATE BEDS OF THE STOCKTON FORMATION

Tl — TRIASSIC LOCKATONG FORMATION

Tdb — TRIASSIC DIABASE

Tbs — TRIASSIC BASALT FLOWS

Sd — SILURIAN DECKER LIMESTONE AND LONGWOOD SHALE FORMATIONS

Sgp — SILURIAN GREEN POND CONGLOMERATE

Omb — ORDOVICIAN MARTINSBURG SHALE

ok — CAMBRO ORDOVICIAN KITTATINNY LIMESTONE

ch — CAMBRIAN HARDYSTON SANDSTONE

PRECAMBRIAN:

gh — HORNBLende GRANITE WITH PYROXENE GRANITE

ga — ALASKITE

am — AMPHIBOLITE

px — PYROXENE GNEISS

gnq — QUARTZ PLAGIOCLASE GNEISS

gnb — BIOTITE GNEISS

sk — SKARN, GRAPHITE SCHIST

nd — FORMATION NOT DETERMINED

A. Elizabeth, Orange

B. Arthur Kill-Elizabeth, Rahway; Hackensack-Hackensack; Passaic-Lower Passaic

C. 2. Map No.	Location	Period of Record
63	Second River at Brighton Ave., East Orange	7/23/38
64	Second River at Bloomfield Ave., Bloomfield	7/23/38
65	Second River at Belleville	1937-1961
66	Second River at Newark Pipe, Belleville	7/23/38
67	Elizabeth River at Irvington	1931-1938
3. 262	Passaic River at Harrison	1967-1971

Water Quality Standards: (explained in Atlas Sheet description)
FW3, TW2 except where classified TW3

D. Brunswick Formation (Trb), Basalt Flows (Trbs)

E. 1. Physiographic Province: Piedmont

Subdivision: Triassic Lowlands

Major Topographic Features: Red Sandstone Plain, Watchung Ridges

Elevations (ft. above sea level): ridges 650, valleys 0

Relief (ft.): 650

2. a. Normal Year: 45"

Dry Year: 37"

Wet Year: 55"

b. January: 31°F

July: 74°F

c. 243 days. Last killing frost: 4/15; first killing frost: 10/20

F. Bergen County:

Riverside County Park and Hackensack River Area

Essex County:

Eagle Rock Reservation

Branch Brook Park

H. Montclair Railroad Terminal, Montclair

Israel Crane House, Montclair

Sydenham House, Newark

Kruegar Mansion, Newark

Penn Station, Newark

First Baptist Peddie Memorial Church, Newark

Saint James A.M.E., Newark

Saint Stephan's Church, Newark

Saint James's Church, Newark

Saint Mary's Church, Newark

Saint Barnabas, Newark

Saint Columba's Church, Newark

Saint John's Church, Newark

Saint Patricks Pro Cathedral, Newark

Queen of Angels Church, Newark

H.(contd.)

Cathedral Evangelica Reformada, Newark
 New Point Baptist Church, Newark
 South Park Presbyterian Church, Newark
 Pan American C.M.A. Church, Newark
 First United Methodist Church, Newark
 House of Prayer Episcopal Church and Rectory, Newark
 Grace Church, Newark
 North Reformed Church, Newark
 The Old First Presbyterian Church, Newark
 Trinity Episcopal Church, Newark

I. Water Well Records

<u>Location</u>	<u>Owner</u>	<u>Year Drilled</u>	<u>Screen Setting or Depth of Casing</u>	<u>Total Depth</u>	<u>g/m Yield</u>	<u>Formation</u>
26-12-157	Hahne & Co.			505	240	Trb
26-12-164	Quadrel, Michael	1955	18	151	75	"
26-12-194	Town of Montclair	1966	21/41	300	950	"
26-12-194	Montclair Water Bureau	1966	16/36	300	470	"
26-12-218	Glen Ridge Country Club	1967	40	300	200	"
26-12-222	Bloomfield Savings Bank	1956		145	100	"
26-12-313	Hoffman-LaRoche			902	128	"
26-12-327	Food Fair Stores, Inc.			209	70	"
26-12-334	Kingsland's Paper Mills			400	125	"
26-12-335	Wiggins Plastics, Inc.	1963	24'-3/12"	378	180	"
26-12-338	Federal Telecommunications Lab	1958	39'6"	500	114	"
26-12-386	Liquid Carbonic Corp.			518	100	"
26-12-389	National Yeast Corp.			512	126	Trbs
26-12-394	Federal Leather Co.			802	60	Trb
26-12-417	Schering Corp.			478	127	"
26-12-423	Kidde W. & Co.			400	400	"
26-12-448	Orange Dairy Co.			250	75	"
26-12-449	City of Orange	1970	61'5"	500	524	"
26-12-478	"	1971	56	506	500	"
26-12-486	Colonial Life Ins. Co.			357	323	"
26-12-513	Leonora Corp.	1957	33	200	70	"
26-12-526	Eastern Tool & Mfg.Co.			550	126	"
26-12-537	National Grain & Yeast Corp.			457	125	"
26-12-545	MGM Records (Div.of Loews)	1959	23	211	115	"
26-12-545	"	1960	36	579	120	"
26-12-547	"			400	275	"
26-12-557	Warner Mfg. Co.			395	220	"
26-12-566	Tiffany & Co.			800	50	"
26-12-577	Bloomfield Moulding Co.	1968	18	350	200	"
26-12-622	Mansol Ceramics Co.			250	100	"
26-12-644	Droll Molding Co., Inc.	1962	50	300	80	"
26-12-655	Summit Chemical Prod.Corp.			414	150	"
✓26-12-657	Crowhurst, A.J. & Sons			83	325	Q
✓26-12-675	Aluminum Finishing Co.			150	100	Trb
✓26-12-682	North Newark Ice Co.			250	123	"
✓26-12-695	V.H. Swenson Co.	1962	49	40	170	"

26-12-723	Mountain Ice Co.			634	300	Trb
26-12-729	Vinton Apartments Inc.	1955	52	255	160	"
26-12-747	Columbia Theaters, Inc.	1953	26	312	140	"
26-12-751	Woolworth & Co.	1965	76'10"	300	80	"
26-12-758	Food Fair Stores	1956	73	214	180	"
26-12-783	Pabst Brewing Co.			535	300	"
26-12-812	Ward Baking Co.			200	111	"
✓26-12-822	Crabb, W. & Co.			600	300	"
✓26-12-827	Trent Hat Corp.			200	150	"
✓26-12-839	Reid Ice Cream Co.			600	100	"
✓26-12-846	Fagin Brothers Coal Yard			150	100	"
✓26-12-864	Barton Realty Co., Inc.	1965		385	100	"
✓26-12-869	Alderney Dairy Co.			450	113	"
✓26-12-893	Ballantine & Son Ale			1200	0	"
✓26-12-896	Mutual Benefit Life Ins.Co.	1965	44'8"	312	219	"
✓26-12-898	Prudential Life Ins. Co.			1225	15	"
✓26-12-918	Abbey Record Co.	1962	24	697	135	"
✓26-12-921	Two Guys from Harrison	1959	99	405	628	"
✓26-12-933	DuPont			202	148	"
✓26-12-942	N.J. Rolling Mills	1963	99	400	20	"
✓26-12-944	Harrison Supply Co.	1966	88	174	50	"
✓26-12-948	Mountain Ice & Fuel Co.			350	122	"
✓26-12-957	Doelger Brewery			400	175	"
✓26-12-966	Verzelano, N.	1959	146	235	150	"
✓26-12-976	Driver-Harris Co.	1946	241	337	600	Q
✓26-12-994	Acme Refining Co.	1960	144	500	150	Trb
✓26-12-996	Lister Brothers			1200	0	"
✓26-12-998	Stanley Tools			637	125	"

J. Geodetic Control Survey monuments described
Index Maps 21,26; adjacent Index Maps 20,25

1 mile {

A. Jersey City, Orange, Weehawken

B. Hudson-Hudson; Hackensack-Hackensack; Passaic-Lower Passaic

C. 3. Map No.	Location	Period of Record
242	Berry's Creek at Moonachie, Moonachie Ave.	1964-
263	Hackensack River at Harrison, Belleville Tpk.	1967-

Water Quality Standards: (explained in Atlas Sheet description)
TW2 except where classified TW3

D. Brunswick Formation (Trb), Stockton Formation (Trs), Diabase (Trdb),
Manhattan Schist (Oms)

E. 1. Physiographic Province: Piedmont
Subdivision: Triassic Lowlands
Major Topographic Features: Red Sandstone Plain, Palisades Ridge,
Hackensack Meadows
Elevations (ft. above sea level): ridges 250, valleys 0
Relief (ft.): 250

2. a. Normal Year: 43"
Dry Year: 36"
Wet Year: 53"

b. January: 32°F
July: 74°F

c. 245 days. Last killing frost: 4/10; first killing frost: 10/20

F. Bergen County:
Riverside County Park and Hackensack River Area

I. Water Well Records

Location	Owner	Year Drilled	Screen Setting or Depth of Casing	Total Depth	g/m Yield	Formation
26-13-157	Pennick, S.B. Co.	1966	42	352	180/200	Trb
26-13-177	Breyer Ice Cream Co.			702	200	"
26-13-195	Omni Chemical Corp.	1968	39	300	157	"
26-13-195	Sika Chemical Corp.	1966	25	302	220	"
26-13-214	Trubeck Laboratories	1956	191	201	105	Q
26-13-215	Beckton & Dickinson	1966	118	363	251	Trb
26-13-216	Marijon Piece Dye Co.	1965	45	285	135	"
26-13-226	Hackensack Water Co.	1954	92'11"	103	No test	Q
26-13-234	U.S. Printing Ink Co.	1965	70	220	60	Trb
26-13-268	Top Notch Plating Co.	1965	21	300	190	"
26-13-298	Alpha Refining Co.			400	115	"
26-13-415	Minit-Man Auto Car Wash	1957	39	180	90	"
✓26-13-447	Food Fair Stores, Inc.	1956	30	320	82	"
✓26-13-499	Pfaff Tool & Mfg. Co.	1963	66.5	740	145	"

26-13
8/76

26-13-598	Erie Railroad			184	200	Trs
26-13-598	"			182	4	Trb
26-13-615	Keystone Metal Finishers	1968	20	200	312	"
26-13-642	"	1950	18	200	76	"
26-13-655/6	"	1960	21	150	150	Trs
26-13-668	Kiesewetter			380	0	Trdb-Trs
26-13-695	North Bergen Realty Co.			72	90	Q
1 mile { 26-13-775	Fairmount Chemical Co.	1965	114	300	300	Trb
26-13-775	United Shellac Co.			475	200	"
26-13-921	Miller & Co.			135	925	Q
26-13-924	DeAngelis Packing Co.	1948		45	0	"
26-13-983	Mehl, John & Co.	1913		1020	150	Trdb
26-13-983	"	1923		1050	40	"
26-13-984	Mountain Ice Co.			950	0	Trdb-PG
26-13-987	Steel Laundry Co.			1028	130	" "
26-13-994	General Refrigerator			1350	0	Trs-PG
26-13-995	Columbia Amusement Park			200	100	Trs

J. Geodetic Control Survey monuments described
Index Maps 21,26; adjacent Index Map 16

A. Elizabeth

B. Arthur Kill-Elizabeth, Elizabeth Channel, Morses Creek; Passaic-Lower Passaic

C. 1. Newark WSO AP - Detailed meteorologic data

2. Map No.	Location	Period of Record
67	Elizabeth River at Irvington	1931-1938
68	Elizabeth River at Nye Ave., Irvington	7/23/38
72	Elizabeth River at Elizabeth	1921-
3. 262	Passaic River at Harrison	1967-1971
272	Elizabeth River at Morris Ave., Elizabeth	1964-

Water Quality Standards: (explained in Atlas Sheet description)
FW3, TW2 except where classified TW3

D. Brunswick Formation (Trb), Stockton Formation (Trs), Diabase (Trdb)

E. 1. Physiographic Province: Piedmont

Subdivision: Triassic Lowlands

Major Topographic Features: Wisconsin Terminal Moraine, Red Sandstone -
Plain, Hackensack Meadows, Newark Bay, Palisades Ridge

Elevations (ft. above sea level): ridges 300, valleys 0
Relief (ft.): 200

2. a. Normal Year: 44"
Dry Year: 36"
Wet Year: 53"

b. January: 32°F
July: 74°F

c. 243 days. Last killing frost: 4/15; first killing frost 10/20

F. Essex County:

Weequahic Park

Union County:

Elizabeth River Park

Warinanco Park

H. Boxwood Hall/Boudinot Mansion, Elizabeth (State Owned)

I. Water Well Records

<u>Location</u>	<u>Owner</u>	<u>Year Drilled</u>	<u>Screen Setting or Depth of Casing</u>	<u>Total Depth</u>	<u>g/m Yield</u>	<u>Formation</u>
26-22-143	Irvington Smelting & Ref.Wks.	1953	71	209	192	Trb
26-22-143	"	1953	62'4"	304	300	"
26-22-145	Associated Mech.Devices	1960	83	250	80	"
26-22-149	Gallo Asphalt Co.	1961	107	201	200	"
✓26-22-213	Krueger Brewing Co.			656	435	"
✓26-22-228	Smith & Smith Funeral Parlor			776	25	"
✓26-22-234	U.S. Navy			565	39	"
✓26-22-237	Conmar Corp.			300	450	"
✓26-22-262	National Lock Washer Co.			800	100	"
✓26-22-275	Linde Air Products Co.	1954	44'5"	500	124	"
✓26-22-293	New York Port Authority	1968	60	370	260	"
✓26-22-322	Standard Bitulithic Co.	1964	89'11"	406	360	"
✓26-22-327	Pfeiffer, H.			505	12	"
✓26-22-333	Arkansas Co., Inc.	1965	72'9"	400	65	"
✓26-22-333	Ronson Metals Corp.	1965	80	300	220	"
✓26-22-334	Wilson, H.A. Co.			778	8	"
✓26-22-345	Chem-Fleur	1965	97	306	200	"
✓26-22-355	Englehard Ind., Inc.	1966	54/79'8"	428	167	"
✓26-22-355	"	1965	80'7"	400	401	"
✓26-22-356	"	1966	78.5/92	495	4	"
✓26-22-368	Rutherford & Delaney Hldg.Co.	1956	42	220	100	"
26-22-411	Bristol Meyers	1967	49	500	159	"
26-22-418	Dillon-Beck Mfg. Co.			379	100	"
26-22-449	Elizabethtown Water Co.			400	550	"
26-22-463	Orbis Products Corp.	1958	157	350	12	"
26-22-517	Pennick, S.B. Co.	1961	64'10"	585	24	"
26-22-518	Pure Carbonic			600	30	"
26-22-546	Black Diamond Grit Co.	1960	92	265	150	"
26-22-574	Londat Aetz Fabric Co.	1965	50	600	30	"
26-22-574	Elizabeth Abbatoir			641	75	"
26-22-744	Morey LaRue Laundry			700	15	"
26-22-745	"			600	14	"
26-22-785	Stevenson Car Co.			300	95	"
26-22-786	Feldman Brothers			805	54	"
26-22-795	Reichold Chemical Co.	1967	39'6"	400	415	"
26-22-828	Singer Mfg. Co.			1200	90	"
26-22-833	General Chemical Co.	1965	106	500	70	"
26-22-842	Clauss Bottling Works			500	50	"
26-22-847	Elizabethtown Gas & Light			300	0	"
26-22-852	Riker Motor Co.			500	0	"
26-22-854	Thomas & Betts Co., Inc.			500	264	"

J. Geodetic Control Survey monuments described
Index Map 26; adjacent Index Map 31

A. Elizabeth, Jersey City

B. Arthur Kill-Elizabeth Channel, Passaic-Upper Passaic

C. 1. Jersey City - Non-recording temperature and precipitation gauges

Water Quality Standards: (explained in Atlas Sheet description)
TW2 except where classified TW3

D. Brunswick Formation (Trb), Stockton Formation (Trs), Diabase (Trdb),
Manhattan Schist (Oms), serpentine (sp)

E. 1. Physiographic Province: Piedmont

Subdivision: Triassic Lowlands

Major Topographic Features: Red Sandstone Plain, Palisades Ridge,
Hackensack Meadows, Newark Bay, New York Bay

Relief: 10'

2. a. Normal Year: 43"

Dry Year: 35"

Wet Year: 49"

b. January: 32°F

July: 74°F

c. 245 days. Last killing frost: 4/10; first killing frost: 10/20

F. Hudson County:

Lincoln Park

Div. of Parks and Forestry:

Liberty State Park

Little Basin Area

G. U.S. National Park Service:

Statue of Liberty National Monument (Ellis Island)

U.S. Army:

Military Ocean Terminal

H. Statue of Liberty National Monument

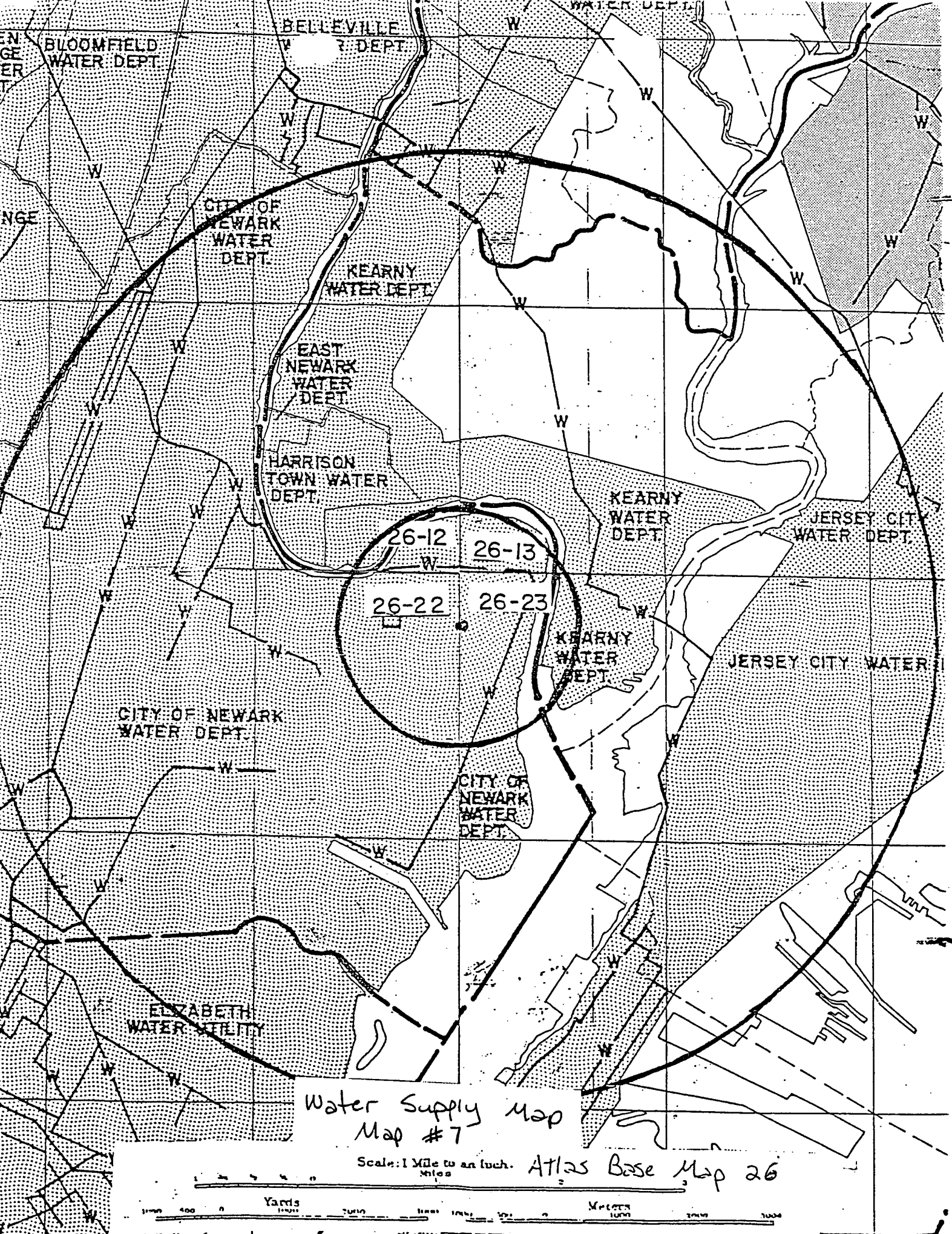
Hudson County Courthouse, Jersey City

I. Water Well Records

Location	Owner	Year Drilled	Screen Setting or Depth of Casing	Total Depth	g/m Yield	Formation
✓ 26-23-111	Pfaff & Kendall	1965	81.5	200	100	Trb
✓ 26-23-142	Lincoln Farm Prod.Co.			109	25	Trbs
✓ 26-23-245	Spalding & Jennings			422	75	Trb-PG
✓ 26-23-291	Berkeley Industries	1956	115/140	335	60	Trbd
✓ 26-23-293/6	Snead & Co.			300	60	Q
26-23-333	Erie Railroad			197	157	Oms
26-23-334	Lembeck & Betz's Brewery			1000	33	Trs
26-23-344	Burnett Ave. (228) Co.			438	55	"
26-23-763	Esso Standard Oil Co.	1959	114/252	505	3	"

J. Geodetic Control Survey monuments described

Index Map 26; adjacent Index Maps 31,21,16



LEGEND

WATER SUPPLY



AREA SERVED BY PRIVATE WATER SERVICE COMPANIES



AREA SERVED BY REGIONALLY OWNED WATER SERVICE COMPANIES



AREA SERVED BY MUNICIPALLY OWNED WATER SERVICE COMPANIES



AREA NOT PRESENTLY SERVED BY WATER SERVICE



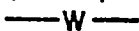
PUBLIC SUPPLY WELLS



WATER MAIN ACROSS HIGHWAY
FOR FUTURE USE



SURFACE WATER INTAKE



MAJOR WATER MAINS

SEWAGE, LANDFILL



AREA SERVED BY PUBLIC SEWAGE SERVICE



AREA NOT PRESENTLY SERVED BY SEWAGE SERVICE



SANITARY LANDFILLS



SEWAGE TREATMENT PLANTS (CAPACITY < 0.3 mgd)



SEWAGE TREATMENT PLANTS (CAPACITY ≥ 0.3 mgd)



MAJOR SEWAGE TRANSMISSION LINES

DRAINAGE BASIN



DRAINAGE BASIN BOUNDARY



RIVER BASIN BOUNDARY



DRAINAGE BASIN NAME



STREAMS AND RIVERS



FLOOD PRONE AREAS

POPULATION



COUNTY BOUNDARY



MUNICIPAL BOUNDARY



POPULATION DENSITY IN PERSONS PER SQUARE MILE



AREA IN SQUARE MILES



PERCENT AREA OF MUNICIPALITY ON BLOCK



MARKET ROADS



BUILT UP AREAS



STATE BOUNDARY

(4)

SUBJECT TO REVISION

Map # 8

WATER WITHDRAWAL
POINTS AND
NJGS CASE INDEX
SITES WITHIN
5.0 MILES OF:

LATITUDE 404305
LONGITUDE 740840

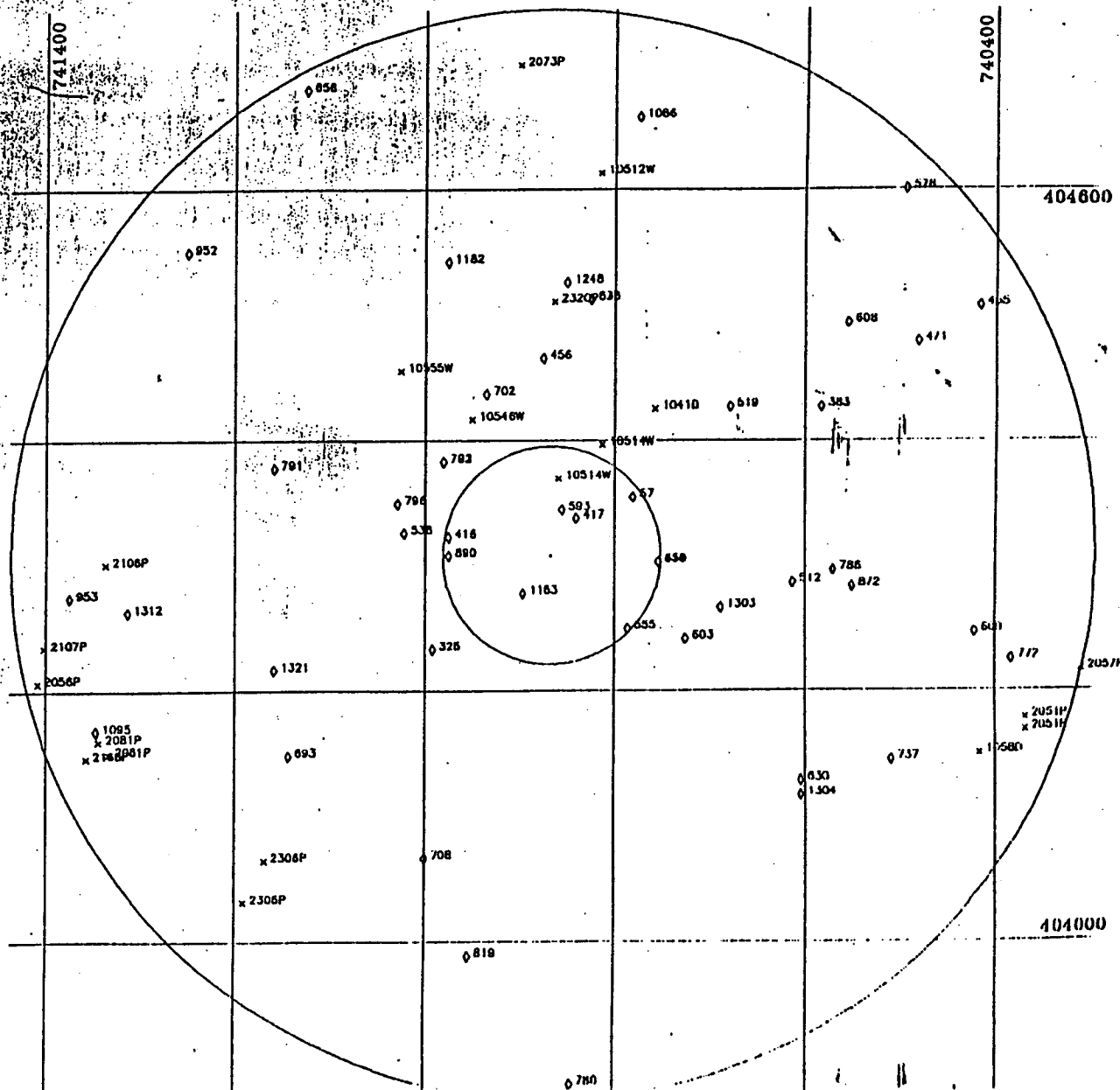
DRAFT

SCALE: 1:63,360
(1 Inch = 1 Mile)

x WATER WITHDRAWAL POINTS
o NJGS CASE INDEX SITES
1 MILE AND 5 MILE RADII INDICATED

NJGS CASE INDEX DATA RETRIEVED FROM:
NEW JERSEY GEOLOGICAL SURVEY
ON 12/22/87

PLOT PRODUCED BY:
NJDEP
DIVISION OF WATER RESOURCES
BUREAU OF WATER ALLOCATION
CN-029
TRENTON, NJ 08625
DATE: 04/26/88



Page 1 of NUGS CASE INDEX SITES WITHIN 5.0 MILES OF 404325 LAT. 740840 LON. AS OF 12/22/87 (IN ORDER BY DECREASING LONGITUDE) - 01/25/88

SITENUM	NAME	LAT	LON	DISTANCE	CONTAM	FINDING1	FINDING2	STATUS1	STATUS2
953	CTX RESIDENCE, MONTCLAIR, ESSEX CO.	404245	741345	4.5	0	0140	3070	1	C
1095	ARROW ENGINEERING, HILLSIDE, UNION CO.	404141	741328	4.5	53	0000	0	1	B
1312	NUCOR CHEMICAL, IRVINGTON, ESSEX CO.	404238	741308	3.9	00	0140	3070	1	C
952	ORANGE WATER DEPT., ORANGE, ESSEX CO.	404530	741230	4.4	00	0130	3070	1	C
791	GENERAL ELECTRIC CO-NEWARK LAMP PLANT	404347	741135	2.7	00	0103	3070	1	B
1321	J.F. HENRY CHEMICAL CO., NEWARK, ESSEX CO.	404210	741135	2.8	63	0110	3070	1	D
693	J.T. BYER, PHILLIPSBURG, WARREN CO.	404129	741126	3.0	00	130	0010	1	A
656	COOPER IND (FORM MCGRAW EDISON), BELLEVILLE, ESSEX CO.	404648	741115	4.8	00	3070	130	1	B
796	J & R METALLIZING CO., INC., NEWARK, ESSEX CO.	404330	741017	1.5	00	0110	3070	1	B
538	J.L. ARMITAGE & CO., NEWARK, ESSEX CO.	404316	741013	1.4	0	130	3070	1	
700	WAFKOWSKI RD. LANDFILL, ELIZABETH, UNION CO.	404040	741000	3.0	50	100	3070	0	
325	FRONTAGE ROAD DRUM DUMP, NEWARK, ESSEX CO.	404220	740955	1.4	1	0130	0	1	B
792	GEORGIA-PACIFIC CORP.-CASTING OPER, NEWARK, ESSEX CO.	404330	740948	1.3	00	0110	3070	1	B
793	GEORGIA-PACIFIC CORP.-POLYMER MATE, NEWARK, ESSEX CO.	404330	740948	1.3	00	0110	3070	1	D
416	ALBERT STEEL DRUM PRENTISS DRUG, NEWARK, ESSEX CO. (DIOXIN)	404314	740945	1.0	72	103	130	1	C
870	CHEMFLUOR, NEWARK, ESSEX CO.	404305	740945	0.9	00	0110		1	B
1182	FRANKLIN PLASTICS, KEARNY, HUDSON CO.	404525	740945	2.8	34	0100	3070	1	A
819	NUDEX, INC - ELIZABETH PLANT, UNION CO.	403953	740932	3.8	00	0103	0100	1	B
702	HARRISON COAL GAS SITE, HUDSON CO.	404422	740921	1.6	70	0110	3070	1	C
1163	DAK ISLAND-CONRAIL TERMINAL, NEWARK, ESSEX CO.	404247	740858	0.4	52			3	
456	LYNN HILL MEADOWS YARD, KEARNY, HUDSON CO.	404439	740845	1.8	52	101	130	1	
573	FEDERATED METALS, NEWARK, ESSEX CO.	404327	740833	0.4	0	130	3070	9	
1248	HUTTON & GREEN, KEARNY, HUDSON CO.	404515	740830	2.5	53	0130	0101	1	C
700	DISCOVERIES, INC, BAYONNE, HUDSON CO.	403851	740827	4.9	63	0103	3070	1	B
417	TRUY CHEM., NEWARK, ESSEX CO.	404323	740824	0.4	38	130	3070	1	
635	80 LISTER AVENUE, NEWARK, (DIOXIN CASE), ESSEX CO.	404507	740815	2.4	72	103	0130	1	B
676	120 LISTER AVE (DIOXIN), NEWARK, ESSEX CO.	404507	740815	2.4	72	0103	0130	1	C
535	CENTRAL STEEL DRUM, NEWARK, ESSEX CO.	404230	740752	1.0	1	130	3070	0	
57	ASLAND CHEM., NEWARK, ESSEX CO.	404333	740749	0.9	53	130	3070	1	
1036	B M Z CONCRETE, NORTH ARLINGTON, BERGEN CO.	404635	740745	4.1	53	0103	0	1	B
410	INLAND CHEM., NEWARK, ESSEX CO.	404302	740733	1.0	00	3070	0	9	
551	SUNARK IND., NEWARK, ESSEX CO.	404302	740733	1.0	63	130	3070	9	
603	TEXACO TERMINAL, NEWARK, ESSEX CO.	404225	740716	1.4	53	130	3070	9	
1303	DRIVERS POINT, JERSEY CITY, HUDSON CO.	404240	740654	1.6	39	0101	0130	1	A
519	SYNOLIN RESINS, KEARNY, HUDSON CO.	404416	740648	2.1	00	103	3070	1	B
512	ROOSEVELT DRIVE-IN (DAYLIN/GRACE), JERSEY CITY, HUDSON CO.	404252	740589	2.2	39	103	101	5	C
630	MURRAY CHEMICAL CORP., BAYONNE CITY, HUDSON CO.	404117	740603	3.1	00	103	0	0	
1304	ROUTE 185, JERSEY CITY, HUDSON CO.	404110	740603	3.2	39	0130	0101	1	B
383	PSEG, KEARNY, HUDSON CO.	404416	740550	2.8	39	130	3070	0	
706	ENGELER INSTRUMENTS, JERSEY CITY, HUDSON CO.	404258	740543	2.6	35	0103	2070	1	B
603	STANDARD CHLORINE, KEARNY, HUDSON CO.	404456	740533	3.5	39	103	101	0	
872	TEXTILE PROOFERS, JERSEY CITY, HUDSON CO.	404250	740531	2.0	03	0103	3070	1	B
737	PJP LANDFILL, JERSEY CITY, HUDSON CO.	404127	740506	3.6	59	103	101	9	
578	CONRAIL GEORGE, HUDSON CO.	404600	740477	4.7	1	102	102	1	
471	KUFFERS, KEARNY, HUDSON CO.	404447	740449	3.9	1	103	102	1	
609	GRIFFIELD AVE., 880, JERSEY CITY, HUDSON CO.	404228	740413	4.0	39	103	101	1	
458	DIAMOND SHYBROOK, S. KEARNY, HUDSON CO.	404404	740410	4.5	35	103	101	1	
772	COLUMBIA PAINT, INC., JERSEY CITY, HUDSON CO.	404215	740350	4.3	00	0103	0110	1	B

Page 1 of NUGS CASE INDEX SITES WITHIN 5.0 MILES OF 404305 LAT, 740840 LON AS OF 12/22/87 (IN ORDER BY SITE NUMBER) - 04/23/88

SITENUM	NAME	LAT	LON	DISTANCE	CONTAM	FMOODE1	FMOODE2	STATUS1	STATUS2
57	ASHLAND CHEM., NEWARK, ESSEX CO.	404333	740749	0.9	53	130	3070	1	
325	FRONTAGE ROAD DRUM DUMP, NEWARK, ESSEX CO.	404220	740755	1.4	1	0130	0	1	B
383	PEERAGE, KEARNY, HUDSON CO.	404416	740850	2.8	38	130	3070	0	
410	INLAND CHEM., NEWARK, ESSEX CO.	404302	740733	1.0	00	3070	0	9	
416	ALBERT STEEL DRUM, PRENTISS DRUG, NEWARK, ESSEX CO. (DIOXIN)	404314	740745	1.0	72	103	130	1	C
417	TROY CHEM., NEWARK, ESSEX CO.	404323	740824	0.4	38	130	3070	1	
455	DIAMOND SHAMROCK, B. KEARNY, HUDSON CO.	404504	740410	4.5	35	103	101	1	
456	CONRAIL MEADOWS YARD, KEARNY, HUDSON CO.	404439	740845	1.8	52	101	130	1	
471	KOPPERS, KEARNY, HUDSON CO.	404447	740449	3.9	1	103	130	9	
512	ROOSEVELT DRIVE-IN (DAYLIN/GRACE), JERSEY CITY, HUDSON CO.	404252	740608	2.2	39	103	101	5	B
519	SYNDON RESINS, KEARNY, HUDSON CO.	404416	740648	2.1	00	100	3070	1	G
538	J.L. ARMITAGE & CO., NEWARK, ESSEX CO.	404316	741013	1.4	0	130	3070	1	
551	SUNMARK IND., NEWARK, ESSEX CO.	404302	740733	1.0	63	130	3070	9	
555	CENTRAL STEEL DRUM, NEWARK, ESSEX CO.	404230	740752	1.0	1	130	3070	0	
578	CONRAIL SECALOUS, HUDSON CO.	404600	740457	4.7	1	103	102	1	
593	FEDERATED METALS, NEWARK, ESSEX CO.	404327	740833	0.4	0	130	3070	9	
603	TEXACO TERMINAL, NEWARK, ESSEX CO.	404225	740716	1.4	53	130	3070	9	
608	STANDARD O-LORINE, KEARNY, HUDSON CO.	404456	740533	3.5	39	103	101	0	
609	GAYFIELD AVE., 800, JERSEY CITY, HUDSON CO.	404228	740413	4.0	39	103	102	1	
630	MOBAY CHEMICAL CORP., BAYONNE CITY, HUDSON CO.	404117	740603	3.1	00	103	101	9	
635	80-LISTER AVENUE, NEWARK, (DIOXIN CASE), ESSEX CO.	404507	740815	2.4	72	103	0130	1	
656	COOPER IND (FORM. MCGRAW EDISON), BELLEVILLE, ESSEX CO.	404648	741115	4.0	00	3070	130	1	C
676	120 LISTER AVE (DIOXIN), NEWARK, ESSEX CO.	404507	740815	2.4	72	0103	0130	1	G
693	J.T. BAYER, PHILLIPSEBURG, WARREN CO.	404129	741126	3.0	00	130	0010	1	A
702	HARRISON COAL GAS SITE, HUDSON CO.	404422	740921	1.6	70	0110	3070	1	C
708	KAPKOWSKI RD. LANDFILL, ELIZABETH, UNION CO.	404040	741000	3.0	50	100	3070	0	
737	RJP LANDFILL, JERSEY CITY, HUDSON CO.	404127	740706	3.6	58	103	101	9	
772	COLUMBIA PAINT, INC., JERSEY CITY, HUDSON CO.	404215	740350	4.3	00	0103	0110	1	B
780	DISCOVERIES, INC., BAYONNE, HUDSON CO.	403851	740627	4.9	63	0103	3070	1	B
786	ENGLER INSTRUMENTS, JERSEY CITY, HUDSON CO.	404258	740543	2.6	35	0103	3070	1	B
791	GENERAL ELECTRIC CO-NEWARK LAMP PLANT	404347	741135	2.7	00	0103	3070	1	H
792	GEORGIA-PACIFIC CORP-CASTING OFER, NEWARK, ESSEX CO.	404350	740948	1.3	00	0110	3070	1	G
793	GEORGIA-PACIFIC CORP-POLYMER MATE, NEWARK, ESSEX CO.	404350	740948	1.3	00	0110	3070	1	F
796	J & R METALLIZING CO, INC., NEWARK, ESSEX CO.	404350	741017	1.5	00	0110	3070	1	B
819	NULDEX, INC - ELIZABETH PLANT, UNION CO.	403953	740952	3.8	00	0103	0100	1	B
872	TEXTILE PROOFERS, JERSEY CITY, HUDSON CO.	404250	740931	2.0	63	0103	3070	1	B
890	CI-M-FLEUR, NEWARK, ESSEX CO.	404305	740945	0.9	00	0110	1	1	B
952	ORANGE WATER DEPT., ORANGE, ESSEX CO.	404530	741230	4.4	00	0130	3070	1	C
953	COX RESIDENCE, MONTCLAIR, ESSEX CO.	404245	741345	4.5	0	0140	3070	1	C
1036	G M / CONCRETE, NORTH ARLINGTON, BERGEN CO.	404535	740745	4.1	53	0103	0	1	B
1095	ARROW ENGINEERING, HILLSIDE, UNION CO.	404141	741538	4.5	53	0010	0	1	P
1163	DAY ISLAND-CONRAIL TERMINAL, NEWARK, ESSEX CO.	404247	740858	0.4	52	0103	3070	1	B
1182	FRANKLIN PLASTICS, KEARNY, HUDSON CO.	404525	740745	2.0	34	0103	3070	1	B
1248	GILGON & GREEN, KEARNY, HUDSON CO.	404515	740940	2.5	51	0130	0101	1	C
1303	DROVERS POINT, JERSEY CITY, HUDSON CO.	404240	740854	1.6	39	0101	0130	1	B
1304	ROUTE 165, JERSEY CITY, HUDSON CO.	404110	740603	3.2	59	0130	0101	1	B
1317	RUBER CHEMICAL, IRVINGTON, ESSEX CO.	404230	741300	5.7	00	0140	3070	1	C
1321	J.F. BERRY CHEMICAL CO., NEWARK, ESSEX CO.	404210	741135	2.0	52	0110	3070	1	B

Page 1 of PRELIMINARY SURVEY OF WATER WITHDRAWAL POINTS WITHIN 5.0 MILES OF 404305 LAT. 740610 LON. (IN ORDER BY DECREASING ELEVATION) - 04/25/83

NUMBER	NAME	SOURCEID	LOCID	LAT	LON	LLACC	DISTANCE	COUNTY	MIN	DEPTH	GRD	ELEV	CAPACITY
2056P	ATLAS TOOL COMPANY, INC.	2601171		404204	741405		4.9 39	07	138		GIFB	100	
2056P	ATLAS TOOL COMPANY, INC.	2602079		404204	741405		4.9 39	07	300		GIFB	100	
2107P	TUSCAN DAIRY FARMS INC	4600102	1	404221	741401		4.8 39	19	300		GIFB	100	
2107P	TUSCAN DAIRY FARMS INC	2604086	2	404221	741401		4.8 39	19	650		GIFB	100	
2168P	SECUR-INKE TECHNOLOGIES INC.	2603615	2	404128	741334		4.7 39	07	461		GIFB	100	
2081P	CERTIFIED PROCESSING CORP.	4600994	1	404136	741326	F	4.5 21	07	202		GIFB	100	
2081P	CERTIFIED PROCESSING CORP.	2604624	3	404136	741326	F	4.5 21	07	250		GIFB	100	
2106P	JERSEY PLASTIC MOLDERS, INC.	2604728	2	404301	741322		4.1 13	09	330		GIFB	100	
2081P	CERTIFIED PROCESSING CORP.	2600265	2	404130	741320	F	4.5 21	07	630		GIFB	100	
2306P	HAYWARD MANUFACTURING PRODUCTS	2604712	1	404019	741154		4.3 39	19	274		GIFB	100	
2306P	HAYWARD MANUFACTURING PRODUCTS	2606867	2	404039	741141		3.8 39	19	275		GIFB	100	
10559W	NEW JERSEY BELL TELEPHONE	2603173	1	404433	741015		2.2 13	14	215		GIFB	100	
10546W	PUBLIC SERVICE ELECTRIC & GAS	4600103	1	404410	740930	F	1.4 17	04	216		GIFB	100	
2073P	INTERNATIONAL MINERALS & CHEM.	4600177	1	404710	740900	T	4.5 13	01	352		GIFB	100	
2073P	INTERNATIONAL MINERALS & CHEM.	4600173	2	404700	740900	T	4.5 13	01	400		GIFB	100	
2073P	INTERNATIONAL MINERALS & CHEM.	2601113	3	404700	740900	T	4.5 13	01	400		GIFB	100	
2306P	UPREYOND PLASTICS CORP.	4600102	1	404506	740838	S	2.3 17	07	500		GIFB	100	
2306P	UPREYOND PLASTICS CORP.	2602384	2	404506	740838	S	2.3 17	07	700		GIFB	100	
10514W	WILSON METALS CORP.	2604993	3	404342	740835	F	0.7 13	14	165		GIFB	100	
10512W	V.H. SWENSON CO., INC.	2602717	1	404408	740807	F	3.5 17	07	400		GIFB	100	
10514W	WILSON METALS CORP.	2603408	1	404358	740808	F	1.1 13	14	300		GIFB	100	
1041D	AMERICAN REF-FUEL COMPANY	175 WELL	POINTS	404415	740735	F	1.6 13	14	35		GIFB	100	
10500	FORT LIBERTY PARTNERS			404150	740410	F	4.3 17	05			GIFB	100	
2051P	LIBERTY HILLSIDE ASSOC.	4600077	STANDBY	404147	740341		4.6 39	07	275		GIFB	100	
2051P	LIBERTY HILLSIDE ASSOC.	4600078	STANDBY	404141	740341		4.6 39	07	186		GIFB	100	
2051P	LIBERTY HILLSIDE ASSOC.	4600079	MAIN B	404141	740341		4.6 39	07	400		GIFB	100	
2051P	LIBERTY HILLSIDE ASSOC.	2600418	MAIN D	404141	740341		4.6 39	07	400		GIFB	100	
2057P	SPINNERIN YARN CO., INC.	4600174	1	404210	740305	F	5.0 03	59	250		GIFB	100	

Number of Observations: 28

Page 1 of 1 PRELIMINARY SLURRY OF WATER WITH NORMAL POINTS WITHIN 5.0 MILES OF 404300 LAT, 740840 LON, (IN ORDER BY PERMIT NUMBER) - 04/25/08

NUMBER	NAME	SOURCEID	LOCID	LAT	LN	LLACC	DISTANCE	COUNTY	MUN	DEPTH	GEO1	GEO2	CAPACITY
1041D	AMERICAN REF FUEL COMPANY	2602717	POINTS	404415	740735	F	1.6	13	14	35	GOSI		200
10512D	V.H. SWENSON CO, INC	2602717		404408	740807	F	3.5	17	07	400	GTRB		150
10514W	RONSON METALS CORP	2603406		404358	740808	T	1.1	13	14	300	GTRB		100
	RONSON METALS CORP	2604997		404342	740835	T	0.7	13	14	165			100
10549D	PUBLIC SERVICE ELECTRIC & GAS	4600103		404410	740730	TF	1.4	17	04	216	GTRB		200
10553D	NEW JERSEY BELL TELEPHONE	2603173		404433	741015	F	2.2	13	14	215	GTRB		90
10560D	PORT LIBERTY PARTNERS	2603173		404130	740410	F	4.3	17	06				200
2051P	LIBERTY HILLSIDE ASSOC	4600077	STANDBY	404147	740341	T	4.6	39	07	275	GTRB		250
	LIBERTY HILLSIDE ASSOC	4600075	STANDBY	404141	740341	T	4.6	39	07	186	GTRB		250
	LIBERTY HILLSIDE ASSOC	4600075	MAIN B	404141	740341	T	4.6	39	07	400	GTRB		455
	LIBERTY HILLSIDE ASSOC	2600418	MAIN D	404141	740341	T	4.6	39	07	400	GTRB		300
2054J	ATLAS TOOL COMPANY, INC	2601171		404204	741405	F	4.9	39	07	138	GTRB		200
	ATLAS TOOL COMPANY, INC	2600075		404204	741405	F	4.9	39	07	300	GTRB		200
2057P	SPINNER YARN COMPANY	2600174		404210	740505	TF	5.0	03	59	230	GTRB		150
2073P	INTERNATIONAL MINERALS CO INC	4600072		404700	740700	T	4.5	13	01	352	GTRB		100
	INTERNATIONAL MINERALS CO INC	4600073		404700	740700	T	4.5	13	01	400	GTRB		150
	INTERNATIONAL MINERALS CO INC	2605113		404700	740700	T	4.5	13	01	400	GTRB		150
2081P	CERTIFIED PROCESSING CORP	4600074		404130	741326	F	4.5	21	07	202	GTRB		100
	CERTIFIED PROCESSING CORP	2600045		404130	741326	F	4.5	21	07	630	GTRB		250
	CERTIFIED PROCESSING CORP	2600424		404130	741326	F	4.5	21	07	250	GTRB		
2104P	JERSEY PLASTIC MOLDERS, INC	2600478		404300	741322	T	4.1	13	09	330	GTRB		185
2107P	TUSCAN DAIRY FARMS, INC	4600102		404221	741401	F	4.8	39	19	300	GTRB		250
	TUSCAN DAIRY FARMS, INC	2604086		404221	741401	F	4.8	39	19	620	GTRB		350
2148P	GEORGE MCGEE INDUSTRIES, INC	2603615		404128	741334	F	4.7	39	07	461	GTRB		200
2204P	HAYWARD MANUFACTURING PRODUCTS	2604712		404015	741154	F	4.3	39	19	274	GTRB		100
	HAYWARD MANUFACTURING PRODUCTS	2606267		404031	741141	F	3.8	39	19	275	GTRB		100
2220P	HONEYCOMB PLASTICS CORP	4600182		404505	740838	B	2.3	17	07	500	GTRB		210
	HONEYCOMB PLASTICS CORP	2602384		404505	740838	B	2.3	17	07	700	GTRB		500

Number of Observations: 28

SITE: *Hummel*
LOCATION: *Newark*

SUMMARY OF SAMPLING DATA
VOLATILES

PAGE

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ATTACHMENT A

DATE SAMPLED *11-14-88*

SAMPLE NO.

MATRIX

UNITS ppb

	MW-1	SW-1	SW-4	S-1	S-2	S-4	S-5	S-6	S-7	S-9	S-10	S-11	S-12	S-14	Sed-1	Sed-2
Chloromethane																
Bromomethane																
Vinyl Chloride															29	
Chloroethane																
Methylene Chloride																
Acetone																
Carbon Disulfide	.75											5J				
1,1-Dichloroethene				7												
1,1-Dichloroethane			15J												25	
1,2-Dichloroethene			370					1J	1J	9J		15		250J	5J	
Chloroform										67						
1,2-Dichloroethane								3J		28						
2-Butanone																600
1,1,1-Trichloroethane				E				1J		2J		8J	7		12	110
Carbon Tetrachloride																
Xylenes		53		5J	52,000	3J	1J	78	3J		120	490	5J	8300	200	1800

SITE: Hummel
LOCATION: Newark

SUMMARY OF SAMPLING DATA
VOLATILES

PAGE 2

ATTACHMENT A

DATE SAMPLED 11-14-88

SAMPLE NO.

MATRIX

UNITS ppb

	Sed-3	Sed-4	Sed-5
Chloromethane			
Bromomethane			
Vinyl Chloride			
Chloroethane			
Methylene Chloride			9900
Acetone			25,000
Carbon Disulfide		145	
1,1-Dichloroethene			
1,1-Dichloroethane		165	7,100
1,2-Dichloroethene		58	81,000
Chloroform			
1,2-Dichloroethane			5,300
2-Butanone			5,000J
1,1,1-Trichloroethane		110	15,000
Carbon Tetrachloride			
Xylenes	145	280	99,000

SUMMARY OF SAMPLING DATA
VOLATILES (CONT.)

PAGE 3 16

ATTACHMENT A

DATE SAMPLED 11-14-88
SAMPLE NO.
MATRIX
UNITS ppb

	MW-1	MW-2	SW-1	SW-2	SW-3	SW-4	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9
Vinyl Acetate															
Bromodichloromethane															
1,1,2,2-Tetrachloroethane															
1,2-Dichloropropane															
trans-1,3-Dichloropropene															
Trichloroethene						75						30	35		48
Dibromochloromethane															
1,1,2-Trichloroethane															
Benzene	6	45		.75	75	435		5705	24		53				
cis-1,3-Dichloropropene															
Bromoform															
4-Methyl-2-Pentanone						575						36			
2-Hexanone															
Tetrachloroethene							45	2505	300	6		13	35	25	6200
Toluene			11	.95	45	120	25	185			15	88	35		
Chlorobenzene					39	77		3100		9		7	12		
Ethylbenzene			6					3400					25	13	
TICS (total)	205	405	50		1605	2005	3865	2.67x10 ⁶	1.76x10 ⁶	727	560	1280	1005	2815	

SUMMARY OF SAMPLING DATA
VOLATILES (CONT.)

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ATTACHMENT A

DATE SAMPLED 11-14-88

SAMPLE NO.

MATRIX

UNITS ppb

	S-10	S-11	S-12	S-13	S-14	Sed-1	Sed-2	Sed-3	Sed-4	Sed-5
Vinyl Acetate			35							
Bromodichloromethane										
1,1,2,2-Tetrachloroethane										
1,2-Dichloropropane										
trans-1,3-Dichloropropene										
Trichloroethene			25		120 J	36			27 J	3100 J
Dibromochloromethane										
1,1,2-Trichloroethane										
Benzene							75		75	520 J
cis-1,3-Dichloropropene										
Bromoform										
4-Methyl-2-Pentanone							3300			
2-Hexanone										
Tetrachloroethene	24	69	83	120	160 J	35	15 J		75	10,000
Toluene	15	96	27			10	130	100	53	96,000
Chlorobenzene						32	160	34	970	33,000
Ethylbenzene		60	12		3000	35	170		42	
TIC'S (total)	43,400	774,500	2,408	110 J	29,000 J	56 J	15,800 J	2,200 J		

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ATTACHMENT

[illegible]

SUMMARY OF SAMPLING DATA
SEMI-VOLATILE COMPOUNDS

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ATTACHMENT A

DATE SAMPLED 11-14-88

SAMPLE NO.

MATRIX

UNITS ppb

	S-5	S-7	S-9	S-13	Sed-1	Sed-4	Sed-5	SW-1	SW-3	SW-4
Phenol		5700 J		6500 J						
bis(2-Chloroethyl) ether										
2-Chlorophenol										
1,3-Dichlorobenzene						56,000			190	
1,4-Dichlorobenzene	180 J				2100 J	24,000		1 J	310	
Benzyl alcohol										
1,2-Dichlorobenzene							14,000 J		11 J	
2-Methylphenol										
bis(2-Chloroisopropyl) ether										
4-Methylphenol										
N-Nitroso-di-n-propylamine										
Hexachloroethane										
Nitrobenzene										
Isophorone										
2-Nitrophenol										
2,4-Dimethylphenol										
Benzoic acid			12,000 J							420 J

SUMMARY OF SAMPLING DATA
SEMI-VOLATILE COMPOUNDS (CONT.)

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ATTACHMENT A

DATE SAMPLED 11-14-88
SAMPLE NO.
MATRIX
UNITS ppb

	S-2	S-3	S-4	S-5	S-6	S-7	S-9	S-12	S-13	S-14	S-15	Sed-3
3-Nitroaniline												
Acenaphthene												
2,4-Dinitrophenol												
4-Nitrophenol												
Dibenzofuran	470J											
2,4-Nitrotoluene												
Diethylphthalate										13,00J		
4-Chlorophenyl-phenylether												
Fluorene												
4-Nitroaniline												
4,6-Dinitro-2-methylphenol												
N-Nitrosodiphenylamine												
4-Bromophenyl-phenylether												
Hexachlorobenzene												
Pentachlorophenol												
Phenanthrene	1500JB	5000JB	8300JB	1800JB	8700JB	4000JB	400JB	10,000B	570JA		290JB	2100JB
Anthracene				310J				55J				

SUMMARY OF SAMPLING DATA
SEMI-VOLATILE COMPOUNDS (CONT.)

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ATTACHMENT

DATE SAMPLED 11-14-88
SAMPLE NO.
MATRIX
UNITS ppb

	sed-5
3-Nitroaniline	
Acenaphthene	
2,4-Dinitrophenol	
4-Nitrophenol	
Dibenzofuran	
2,4-Nitrotoluene	
Diethylphthalate	
4-Chlorophenyl-phenylether	
Fluorene	20,000 J
4-Nitroaniline	
4,6-Dinitro-2-methylphenol	
N-Nitrosodiphenylamine	
4-Bromophenyl-phenylether	
Hexachlorobenzene	
Pentachlorophenol	
Phenanthrene	36,000 JB
Anthracene	

SUMMARY OF SAMPLING DATA
SEMI-VOLATILE COMPOUNDS (CONT.)

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ATTACHMENT A

DATE SAMPLED 11-14-88
SAMPLE NO.
MATRIX
UNITS ppb

	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11
Di-n-butylphthalate	990 JB	770 JB	3400 JB	4000 JB	4000 JB	2200 JB	3000 JB		1800 JB		
Fluoranthene		2000 JB	5100 JB	9700 JB	20000 JB	13,000 JB	6900 JB	1300 JB			
Pyrene	1200 JB	1200 JB	4400 JB	7400 JB	2200 JB	12,000 JB	7200 JB	1100 JB	1700 JB		4100 JB
Butylbenzylphthalate											
3,3-Dichlorobenzidine											
Benzo (a) anthracene		1300 J	3400 J	4200 J		6200 J	3800 J				
Chrysene		2500 J		4200 J		6700 J	4800 J				
bis(2-Ethylhexyl) phthalate	1600 JB	76,000 B	26000 B	86,000 B	120,000 B			29,000 B	27,000,000 B	21,000 B	7400 JB
Di-n-octylphthalate						4400 J	2400 J				
Benzo (b) fluoranthene		2800 JB	3600 JB	3500 JB	1300 JB	8500 JB	4700 JB				
Benzo (k) fluoranthene		15000 JB		3800 JB	910 JB	5600 JB	3900 JB				
Benzo (a) pyrene		980 JB		3500 JB	910 JB	6600 JB	3800 JB				
Indeno (1,2,3-cd) pyrene		1600 J					2400 J				
Dibenz (a,h) anthracene		780 J									
Benzo (g,h,i) perylene		6100 J			820 J						
TICs (total)	400,000	96,000	760,000	9,000	321,000	59,000	46,000	30,000	12.02 x 10 ⁶	248,000	1.69 x 10 ⁶

SUMMARY OF SAMPLING DATA
SEMI-VOLATILE COMPOUNDS (CONT.)

PAGE 10 16

ATTACHMENT A

DATE SAMPLED 11-14-88

SAMPLE NO.

MATRIX

UNITS ppb

	S-12	S-13	S-14	S-15	Sed-1	Sed-2	Sed-3	Sed-4	Sed-5	SW-1	SW-2	SW-3
Di-n-butylphthalate	590 JB		2800 JB	73 JB	910 JB	1200 JB	1200 JB	3000 JB	1	2 JB	2 JB	8 JB
Fluoranthene	1300 JB	1200 JB		470 B			2600 JB		6900 JB	--		
Pyrene	10,000 B	1200 JB	5600 JB	500 B			2500 JB		11000 JB			
Butylbenzylphthalate	1100 JB								53,000 JB			
3,3-Dichlorobenzidine									1			
Benzo (a) anthracene	5100 J			250 J			1000 J					
Chrysene	11,000	1500 J		310 J			2100 J					
bis(2-Ethylhexyl) phthalate	11000 B		62000 JB	6600 B	4900 JB	3100 JB	33,000 B	37,000 JB	3,600,000 B	10 JB	11 JB	82 B
Di-n-octylphthalate			10000 J				1700 J					
Benzo (b) fluoranthene	7700 B	1800 JB		250 JB								
Benzo (k) fluoranthene	6500 B	1400 JB		200 JB								
Benzo (a) pyrene	5000 JB	1100 JB		200 JB								
Indeno (1,2,3-cd) pyrene	3300 J	1100		110 J								
Dibenz (a,h) anthracene												
Benzo (g,h,i) perylene	4100 J	1500		170 J								
TIC's (total)	135,000	323,000	2.2 x 10 ⁶	10,100	56,000	920,000	439,400	470,000	3.24 x 10 ⁶	46	34	570

SUMMARY OF SAMPLING DATA
SEMI-VOLATILE COMPOUNDS (CONT.)

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ATTACHMENT A

DATE SAMPLED 11-14-81
SAMPLE NO.
MATRIX
UNITS ppb

	610-4	FB
Di-n-butylphthalate		35B
Fluoranthene		
Pyrene		
Butylbenzylphthalate		
3,3-Dichlorobenzidine		
Benzo (a) anthracene		
Chrysene		
bis(2-Ethylhexyl) phthalate	2107B	12 B
Di-n-octylphthalate		
Benzo (b) fluoranthene		
Benzo (k) fluoranthene		
Benzo (a) pyrene		
Indeno (1,2,3-cd) pyrene		
Dibenz (a,h) anthracene		
Benzo (g,h,i) perylene		
TIC'S (total)	7200	

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ATTACHMENT

[illegible]

SUMMARY OF SAMPLING DATA
PESTICIDES AND PCBs (CONT.)

PAGE 13 OF 16

DATE SAMPLED 11-14-88

SAMPLE NO.

MATRIX

UNITS ppb

	S-1	S-2	S-3	S-5	S-6	S-7	S-8	S-10	S-11	S-12	S-13	S-14	S-15	Sed-1	Sed-2	Sed-3	Sed-4	Sed-5
alpha-Chlordane																		
gamma-Chlordane										680J								
Toxaphene																		
Aroclor-1016																		
Aroclor-1221																		
Aroclor-1232																		
Aroclor-1242																		
Aroclor-1248	65,000	3700 J	3100 J	1800	8800	62,000	6200 J	1000 J	45,000	21,000	87,000	17,000	220 J	2700	4100	4800 J	4200 J	14000 J
Aroclor-1254																		
Aroclor-1260																		

ATTACHMENT

PAGE 14 OF 16

ATTACHMENT

ppb

ppm \rightarrow

[illegible]

SUMMARY OF SAMPLING DATA
METALS (CONT.)DATE SAMPLED 11-14-88
SAMPLE NO.
MATRIX
UNITS

ppb

ppm →

	MW-1	MW-2	SW-3	SW-4	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-11	S-12	S-13	S-14	S-15	S-16	S-17
Selenium																			
Silver			112	55.1					25.4										
Sodium																			
Thallium																			
Vanadium						108			388	205				144					
Zinc	51,500	84,600		35,500	635	554	484	538	1790	1106	1010	719	1320	1680	1120	1170	430	5230	977
Cyanide			5580						131										69

Other

ATTACHMENT A

SUMMARY OF SAMPLING DATA
METALS

PAGE 16 OF 16

ATTACHMENT A

DATE SAMPLED 11-14-88
SAMPLE NO.
MATRIX
UNITS ppm

	S-13	S-14	Sed-2	Sed-3	Sed-4	Sed-5	
Aluminum							
Antimony	145	27.1					
Arsenic	20.3	78.1					
Barium	560	554				468	
Beryllium							
Cadmium	5.2	5.1		4	14.1	12	
Calcium							
Chromium	5360	797	369		209	512	
Cobalt							
Copper	234	342			895	323	
Iron							
Lead	1320	2360		234	482	697	
Magnesium							
Manganese							
Mercury	1.8	5.9	12			3.9	
Nickel			347		668	127	
Potassium							

HUMMEL CHEMICAL COMPANY
185 FOUNDRY STREET
NEWARK, ESSEX COUNTY
EPA ID# NJD002174712

The Hummel Chemical Company formerly operated a chemical warehouse/distribution center out of a small industrial complex at 185 Foundry Street in Newark, Essex County. It is also likely that operations at the site included reacting and mixing of chemicals, most of which were in powdered form. Hummel Chemical was located in Newark until the mid 1960's when operations were transferred to South Plainfield, New Jersey. It is not known how long the company operated at the Newark site. It is also not known what buildings within the complex the company may have occupied. Officials of Hummel Chemical and the Norpak Corporation/KEM Realty Company, who formerly owned a majority of the property in the complex, were questioned as to what buildings Hummel Chemical may have occupied, but no records with that information are available.

Very little information is available concerning the company's operations in Newark. According to EPA's publication, "Dioxins", published in 1980, potential dioxin precursors such as 2,4-dinitrophenoxyethanol, 3,5-dinitrosalicylic acid, picric acid and hexachlorobenzene were present at Hummel Chemical Newark plant. However, it is unknown what other types of chemicals may have been present at the site or what types of storage/disposal methods were used by the company.

A review of information concerning the company's South Plainfield facility had revealed that poor housekeeping and operational practices had led to fires, explosions and employee injury, as well as groundwater, surface water and soil contamination. Because of the company's disregard for employee and public health and safety, as well as the lack of concern for the environment as shown at their South Plainfield facility, it is probable that a similar sentiment existed at the company when they operated in Newark. Therefore, it is likely that improper disposal of hazardous substances also occurred at the Newark facility. Because dioxin type compounds like those which were present at Hummel Chemical's Newark facility do not readily migrate vertically through the soil column, it is likely that many of these substances may still be present near the soil surface. This is cause for concern as the site, as well as adjacent properties, many of which are vacant and may have also been used for disposal, are easily accessible to the public. It should also be noted that since many of the substances used by Hummel Chemical were in powdered form, and dioxin type compounds have an affinity to bind with soil particles, it is possible for contaminants to be transported offsite as dust particles or aerosols. This would allow contaminants to spread throughout the area and possibly contaminate residential areas. The nearest residential area lies only .5 miles west of the site. Since storm drains in the area discharge to the Passaic River, it is also possible for the river to be contaminated by runoff from the site. This may have a direct impact on aquatic biota in

ATTACHMENT B

the river because dioxin type compounds may bioaccumulate in aquatic organisms and pose a biomagnification threat, which leads to the possibility of food chain contamination. Because the dioxin type compounds do not readily migrate vertically through the soil, this also makes them readily available to terrestrial organisms. Migratory birds would seem to be the most susceptible because of the proximity of the site to the Hackensack Meadowlands. It is also possible that other hazardous substances utilized by Hummel Chemical, besides the dioxin type compounds, may have also been improperly disposed and contributed to soil and surface water contamination. Depending upon the characteristics of these substances and their ability to migrate through the soil column, it is possible groundwater contamination has occurred. Groundwater in the area, which is used only for industrial purposes, is derived from two aquifer systems. The high yield aquifer originating from the Brunswick Formation, which is the main source of groundwater in Essex County, may be contaminated by substances disposed at the site although it is relatively deep and is protected in much of the area by confining clay layers. However, the low yield aquifer existing in the unstratified drift of Pleistocene age is more likely to be affected since it exists near the surface (Attachment F).

Another cause for concern is the health of employees of the current occupant of the buildings formerly utilized by Hummel Chemical. Because of mixing operations used by the company at their South Plainfield facility which allowed chemicals to spread throughout the process buildings, it is highly likely this also occurred at Newark. If these buildings were not properly decontaminated after Hummel Chemical's departure, employees may be constantly inhaling dangerous compounds.

Although the compounds known to be present at the site are considered Class III dioxin compounds (compounds which have a very low potential to change into dioxins), a high priority for further investigation is warranted because of the lack of information available and the threats to the population and the environment. It is recommended that a site inspection be conducted as soon as possible to characterize contamination present on site. Sampling should include shallow soil samples to be analyzed for dioxins and priority pollutants plus forty, as well as deep soil samples to be analyzed for priority pollutants plus forty. Determination of sampling locations and number of samples would be based on information obtained during an on-site presampling assessment. It is also recommended that officials of Hummel Chemical physically identify the buildings which they believe the company may have occupied. Wipe samples to be analyzed for dioxins should be taken from inside these buildings to determine if residues from past operations still exist which may constitute a health hazard to current employees. Based on review of sample analyses, additional investigations, including installation of monitor wells to survey groundwater conditions may also be necessary. All potential migration pathways of substances off site, including storm drains, should also be investigated and closed off. Lastly, it should also be ensured that proper security is implemented to prevent unauthorized entry onto the site.



Preliminary Assessment

Hummel Chemical Company
185 Foundry St.
Newark, Essex Co.
NJD002174712



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

1. IDENTIFICATION
01 STATE 02 SITE NUMBER
NJ D002174712

II. SITE NAME AND LOCATION

01 SITE NAME (Name, address, or description of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER			
Hummel Chemical Co.	185 Foundry St.			
03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE 08 CONG DIST
Newark	NJ		Essex	
09 COORDINATES	LATITUDE		LONGITUDE	
40° 43' 34"	74° 08' 01"		Block Unknown Lot Unknown	

10 DIRECTIONS TO SITE (Starting from nearest public road)

New Jersey Turnpike to Exit 15E. Take Doremus Ave. and make a right onto Roanoke Ave. Follow Roanoke to Foundry St. Make a right on Foundry St. and site is approximately 1500 feet to the left.

III. RESPONSIBLE PARTIES

01 OWNER (if known)	02 STREET (if known, listing, address)			
It is unknown what buildings that Hummel occupied, however the owner of the property				
03 CITY	04 STATE	05 ZIP CODE	06 TELEPHONE NUMBER	
at that time was the Norpak/KEM Realty Company.			()	
07 OPERATOR (if known and different from owner)	08 STREET (if known, listing, address)			
Hummel Chemical Company	10 Harmich Road			
09 CITY	10 STATE	11 ZIP CODE	12 TELEPHONE NUMBER	
South Plainfield	NJ	07090	201 754-1800	
13 TYPE OF OWNERSHIP (Check one)				
<input checked="" type="checkbox"/> A. PRIVATE <input type="checkbox"/> B. FEDERAL <input type="checkbox"/> C. STATE <input type="checkbox"/> D. COUNTY <input type="checkbox"/> E. MUNICIPAL				
<input type="checkbox"/> F. OTHER <input type="checkbox"/> G. UNKNOWN				

14 WHEN OPERATOR NOTIFICATION BY FILE (Check one)

☐ A. RCRA 3001 DATE RECEIVED: MONTH DAY YEAR ☐ B. UNCONTROLLED WASTE SITE (RCRA 103) DATE RECEIVED: MONTH DAY YEAR ☐ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION	02 BY (Check all that apply)			
<input type="checkbox"/> YES DATE MONTH DAY YEAR	<input type="checkbox"/> A. EPA <input type="checkbox"/> B. EPA CONTRACTOR <input type="checkbox"/> C. STATE <input type="checkbox"/> D. OTHER CONTRACTOR			
<input checked="" type="checkbox"/> NO	<input type="checkbox"/> E. LOCAL HEALTH OFFICIAL <input type="checkbox"/> F. OTHER: (Specify)			
CONTRACTOR NAME(S):				

03 SITE STATUS (Check one)	04 YEARS OF OPERATION
<input checked="" type="checkbox"/> A. ACTIVE <input type="checkbox"/> B. INACTIVE <input type="checkbox"/> C. UNKNOWN	BEGINNING YEAR ENDING YEAR <input checked="" type="checkbox"/> UNKNOWN

05 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED

Picric acid, hexachlorobenzene, 3,5 dimtro salicylic acid and 2,4-dinitrophenoxyethanol, which are all potential dioxin precursors, were known to be present at the site. It is unknown what other substances may have been present. See hazardous substance list- ing for substances which were possibly present.

06 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION

Although little is known about Hummel's operations in Newark, the disregard for the environment and public and employee health and safety at the company's South Plainfield facility leads to the likelihood that soil, groundwater and surface water contamination has also occurred at Newark.

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one)	02 OF (Agency or other entity)		
<input checked="" type="checkbox"/> A. HIGH (Immediate public health or safety)	<input type="checkbox"/> B. MEDIUM (Potential public health or safety)	<input type="checkbox"/> C. LOW (Potential public health or safety)	<input type="checkbox"/> D. NONE (No further action needed; consider current inspection only)

VI. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency or other entity)	03 TELEPHONE NUMBER
Robert Beretsky	NJDEP/DHWM/BPA	609 984-3014
04 PERSON RESPONSIBLE FOR ASSESSMENT	05 AGENCY	06 ORGANIZATION
Robert Beretsky	NJDEP	DHWM/BPA
		07 TELEPHONE NUMBER
		609 984-3014
		08 DATE
		9/11/87



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE 02 SITE NUMBER
NJ D002174712

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)	02 WASTE QUANTITY AT SITE (Indicate one of these quantities that are representative)	03 WASTE CHARACTERISTICS (Check all that apply)
<input checked="" type="checkbox"/> A SOLID <input checked="" type="checkbox"/> B POWDER, FINES <input type="checkbox"/> C SLUDGE <input type="checkbox"/> D OTHER (Specify)	<input type="checkbox"/> E SLURRY <input type="checkbox"/> F LIQUID <input type="checkbox"/> G GAS TONS } Unknown CUBIC YARDS } NO OF DRUMS }	<input checked="" type="checkbox"/> A TOXIC <input type="checkbox"/> B CORROSIVE <input type="checkbox"/> C RADIOACTIVE <input checked="" type="checkbox"/> D PERSISTENT <input type="checkbox"/> E SOLUBLE <input type="checkbox"/> F INFECTIOUS <input checked="" type="checkbox"/> G FLAMMABLE <input checked="" type="checkbox"/> H IGNITABLE <input type="checkbox"/> I HIGHLY VOLATILE <input type="checkbox"/> J EXPLOSIVE <input type="checkbox"/> K REACTIVE <input type="checkbox"/> L INCOMPATIBLE <input type="checkbox"/> M NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLJ	SLUDGE			According to EPA's "DIOXINS"
CLW	CLAY WASTE			book published in 1980, 2,4
SOL	SOLVENTS			dinitrophenoxy ethanol, hexachlor-
PSO	PESTICIDES			obenzene, 3,5 dinitrosalicylic acid
OCO	OTHER ORGANIC CHEMICALS	Unknown		and picric acid were present at
OC	INORGANIC CHEMICALS			the Newark site. However it is
ACD	ACIDS			unknown how much of these
BAS	BASES			substances were present. It is
MES	HEAVY METALS			also unknown what other types of
				substances may have been present.

IV. HAZARDOUS SUBSTANCES (See Appendix for Hazard Identification Code CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/ DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
OCC	2,4-Dinitrophenoxyethanol		Present on site according to		
OCC	3,5-dinitrosalicylic acid		EPA's "DIOXINS" book - see		
OCC	hexachlorobenzene	188-74-1	Attachment A		
OCC	picric acid				
OCC	2,4-dinitrophenol	51-28-5	These substances are used by Hummel		
OCC	hydrazine	302-01-2	Chemical at their South Plainfield, NJ		
			plant. These substances were also		
OCC	hexachloroethane	67-72-1	possibly present at the Newark facility		
IOC	lead nitrate	18256-98-4	since it is believed similar operations		
IOC	lead dioxide	7439-92-1	were conducted at both facilities.		
IOC	lead chromate	18454-12-1			
IOC	bariumchromate	7440-47-3			
IOC	zinc oxide	7440-66-6			
OCC	ethylene glycol	107-21-1			

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Can include references, e.g., documents, articles, reports, etc.)

Attachment A - EPA - "DIOXINS" EPA-600/2-80-197



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE 02 SITE NUMBER
NI D002174712

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply) <input type="checkbox"/> A SOLID <input type="checkbox"/> B POWDER, FINES <input type="checkbox"/> C SLUDGE <input type="checkbox"/> D OTHER (Specify)	02 WASTE QUANTITY AT SITE (Measurements of waste quantities must be substantiated) TONS _____ CUBIC YARDS _____ NO OF DRUMS _____	03 WASTE CHARACTERISTICS (Check all that apply) <input type="checkbox"/> A TOXIC <input type="checkbox"/> B CORROSIVE <input type="checkbox"/> C RADIOACTIVE <input type="checkbox"/> D PERSISTENT <input type="checkbox"/> E SOLUBLE <input type="checkbox"/> F INFECTIOUS <input type="checkbox"/> G FLAMMABLE <input type="checkbox"/> H IRRITABLE <input type="checkbox"/> I HIGHLY VOLATILE <input type="checkbox"/> J EXPLOSIVE <input type="checkbox"/> K REACTIVE <input type="checkbox"/> L INCOMPATIBLE <input type="checkbox"/> M NOT APPLICABLE
--	---	--

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OLY WASTE			
SOL	SOLVENTS			
PSO	PESTICIDES			
OCO	OTHER ORGANIC CHEMICALS			
OC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for HCS Inventory List CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/ DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
MES	Arsenic	7440-38-2			
OCO	Isopropanol	67-63-0			
SOL	Methanol	67-56-1			
ACD	Nitric acid	7697-37-2			
ACD	Oxalic acid	144-62-7			
ACD	Rosin acid	999			
BAS	Sodium hydroxide	1310-73-2			
OCO	Toluene	108-88-3			
OCO	Resorcinol	108-46-3			
IOC	Cupric oxide	7440-50-8			
IOC	Antimony trisulfide	7740-58-2			
OCO	Ammonium oxalate	999			
IOC	Lead thiocyanate	592-87-0			
SOL	Acetone	67-64-1			

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (See Appendix for Guidance on Sources of Information)

--



POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE NJ 02 SITE NUMBER D002174712

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☒ A. GROUNDWATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☒ POTENTIAL ☐ ALLEGED

Although dioxin type compounds do not readily migrate through soil, other substances which were improperly disposed by the company may migrate through soil and contaminate groundwater.
Attachment D, E, F

01 ☒ B. SURFACE WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☒ POTENTIAL ☐ ALLEGED

Improperly disposed hazardous substances may enter the nearby Passaic River via storm drains or groundwater discharges. Storm drains in the area discharge to the river.
Attachment

01 ☐ C. CONTAMINATION OF AIR
03 POPULATION POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☐ POTENTIAL ☐ ALLEGED

Hazardous substances disposed by the company may become airborne as dust particles or aerosols. The company is also known to have mixed powdered chemicals in a manner which allowed the chemicals to become airborne throughout the process buildings. These chemicals could have also been transferred to the outside atmosphere via exhaust fans.
Attachment C

01 ☐ D. FIRE/EXPLOSIVE CONDITIONS
03 POPULATION POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☐ POTENTIAL ☐ ALLEGED

The company has not been located at the Newark facility for more than twenty years, therefore a potential for fires or explosions as a result of Hummels' activities is very low.

01 ☒ E. DISPOSAL METHODS
03 POPULATION POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☒ POTENTIAL ☐ ALLEGED

It is unknown what type of disposal/storage methods were used by the company at the Newark facility. However, poor housekeeping and operational practices, which are a trademark of Hummel, may have lead to improper disposal on adjacent properties which are easily accessible to private citizens.
Attachment C, E

01 ☒ F. CONTAMINATION OF SOIL
03 AREA POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☒ POTENTIAL ☐ ALLEGED

Soil contamination may have occurred as a result of poor housekeeping and operational practices which are common at Hummel Chemical facilities. Also, since dioxin type compounds, similar to those produced by the company, do not readily biodegrade or migrate through soil, it is likely any of these substances disposed by the company are still present.
Attachment A, C, E

01 ☐ G. DRINKING WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☐ POTENTIAL ☐ ALLEGED

There are no drinking water sources in the area, therefore no potential exists.

01 ☒ H. WORKER EXPOSURE/INJURY
03 WORKERS POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☒ POTENTIAL ☐ ALLEGED

Because Hummel was known to have mixed powdered chemicals in a manner which allowed the chemicals to spread throughout their process building, it is likely employees of the current occupant may come into contact with these chemicals if the building was not completely decontaminated.
Attachment C

01 ☒ I. POPULATION EXPOSURE/INJURY
03 POPULATION POTENTIALLY AFFECTED: _____

02 ☐ OBSERVED (DATE: _____)
04 NARRATIVE DESCRIPTION

☒ POTENTIAL ☐ ALLEGED

Private citizens could be exposed to hazardous substances which were improperly disposed by the company. Citizens could come into contact with the substances as dust particles or aerosols which were blown off site. A large residential area lies only .5 miles west of the site.
Attachment A, C

<div style="display: inline-block; text-align: center;"> POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT </div>		I. IDENTIFICATION <small>01 STATE 02 SITE NUMBER</small> NJ D002174712	
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS			
II. HAZARDOUS CONDITIONS AND INCIDENTS			
01 <input checked="" type="checkbox"/> DAMAGE TO FLORA 04 NARRATIVE DESCRIPTION	02 <input type="checkbox"/> OBSERVED (DATE: _____)	<input checked="" type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED
Flora may be impacted by hazardous substances disposed by the company, especially dioxin type compounds which may accumulate in plant tissues. <div style="text-align: right;">Attachment A pp. 33-34</div>			
01 <input checked="" type="checkbox"/> DAMAGE TO FAUNA 04 NARRATIVE DESCRIPTION	02 <input type="checkbox"/> OBSERVED (DATE: _____)	<input checked="" type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED
Fauna may be impacted by hazardous substances disposed by the company, especially dioxin type compounds which may accumulate in animal tissues. <div style="text-align: right;">Attachment A pp 25-33</div>			
01 <input checked="" type="checkbox"/> CONTAMINATION OF FOOD CHAIN 04 NARRATIVE DESCRIPTION	02 <input type="checkbox"/> OBSERVED (DATE: _____)	<input checked="" type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED
Hazardous substances disposed by the company, especially dioxin type compounds which bioaccumulate in animal tissues, may biomagnify through the trophic levels of the food chain. This is of great concern in this area because of the proximity to the Hackensack Meadowslands. <div style="text-align: right;">Attachment A pp. 25-34</div>			
01 <input checked="" type="checkbox"/> UNSTABLE CONTAINMENT OF WASTES 04 NARRATIVE DESCRIPTION	02 <input type="checkbox"/> OBSERVED (DATE: _____)	<input checked="" type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED
Little is known about storage/disposal methods used by Hummel at the Newark facility. However because of the poor housekeeping and operational practices observed at the company's South Plainfield facility, it is likely similar conditions existed in Newark. <div style="text-align: right;">Attachment C, E</div>			
01 <input checked="" type="checkbox"/> DAMAGE TO OFFSITE PROPERTY 04 NARRATIVE DESCRIPTION	02 <input type="checkbox"/> OBSERVED (DATE: _____)	<input checked="" type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED
Adjacent properties may be damaged by improperly disposed hazardous substances.			
01 <input checked="" type="checkbox"/> CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs 04 NARRATIVE DESCRIPTION	02 <input type="checkbox"/> OBSERVED (DATE: _____)	<input checked="" type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED
Hummel is known to have disposed hazardous substances through floor drains at their South Plainfield facility. It is likely hazardous substances were also disposed of in this manner as well as through storm drains at the Newark site. Floor drains lead to the local sewage authority and storm drains discharge to the Passaic River. <div style="text-align: right;">Attachment D</div>			
01 <input checked="" type="checkbox"/> ILLEGAL/UNAUTHORIZED DUMPING 04 NARRATIVE DESCRIPTION	02 <input type="checkbox"/> OBSERVED (DATE: _____)	<input checked="" type="checkbox"/> POTENTIAL	<input type="checkbox"/> ALLEGED
It is unknown what type of disposal was used at the site by Hummel. However, because of the lack of environmental concern shown by Hummel at its South Plainfield location, it is likely illegal/unauthorized dumping has occurred at the Newark site. <div style="text-align: right;">Attachment C,D,E</div>			
05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL OR ALLEGED HAZARDS			
III. TOTAL POPULATION POTENTIALLY AFFECTED: _____			
IV. COMMENTS			
This company is <u>not</u> related to the Hummel-Lamolin Corp. which is located in the same complex.			
V. SOURCES OF INFORMATION			
Attachment A - EPA publication - "DIOXINS" - EPA-600/2-80-197 Attachment B - Memos to File Attachment C,D,E - NJDEP/Hazardous Waste Management/Bureau of Planning and Assessment Attachment F - Groundwater Survey of Essex County			

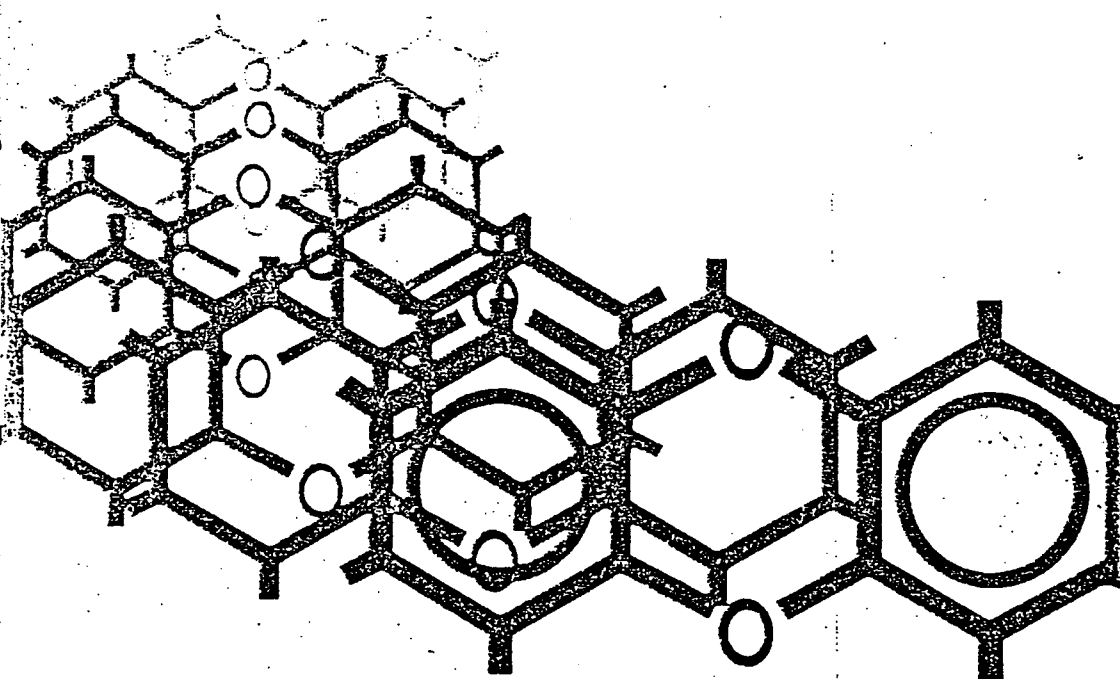
ATTACHMENT B

United States
Environmental Protection
Agency

Industrial Environmental Research
Laboratory
Cincinnati OH 45268

Research & Development

EPA Dioxins



ATTACHMENT C

Attachment A-1

EPA-600/2-80-197
November 1980

DIOXINS

M.P. Esposito, T.O. Tiernan, and
Forrest E. Dryden

Contract Nos. 68-03-2577
68-03-2659
68-03-2579

Project Officer
David R. Watkins
Industrial Pollution Control Division
Industrial Environmental Research Laboratory
Cincinnati, Ohio 45268

INDUSTRIAL ENVIRONMENTAL RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

A-2

ATTACHMENT C

Florida. A.F. Armament Lab. AFATL-TR-

Tetrachlorodibenzo-*p*-Dioxin (TCDD)
Decontamination Recommendations

Environmental Fate, and Human Risk
of Tetrachlorodibenzo-*p*-Dioxin. USAF, OEHL Technical

Accidental Contamination by TCDD:
Lavoro, 67(5):371-378.

Chlor auf Phenole. Ber., 27:550.

Clinical Chemistry Effects of 2,3,7,8-
Tetrachlorodibenzo-*p*-Dioxin in Laboratory Animals. Environmental Health

1972. Contamination of the Bay of
Fundra. Polychlorinated Biphenyls, Polychlorinated
Dioxins, and Dibenzofurans. Environ-

APPENDIX A

The tables that follow list organic chemicals and pesticides selected for study on the basis of potential dioxin contamination, with known producers and production locations, present and past. The primary source of producer information is the Stanford Research Institute Directory of Chemical Producers. The tabulations are by chemical, with producers and locations; and by producer and location, with chemicals. The tabulations by chemical (Tables A1, A2, A3, and A6) are segregated according to the classifications based on dioxin concern as defined in Section 3. The classification information is also noted in the producer location tables by means of Roman numerals following the chemical names.

The tabulations by producer and location (Tables A4 and A7) group all of the critical chemicals involved at each manufacturer location. These lists do not necessarily define the site subject to exposure, because many dumps are remote from the plants; they do provide a starting point for such definition. Abandoned production of a chemical or abandoned facilities may present special problems. Therefore, the production facilities noted since 1968 but no longer active in 1978 are footnoted and are also extracted in separate tables (Tables A5 and A8). Some of these sites remain active in other production, and some may retain production capability and/or minor production of the subject chemical. Other plant sites may be totally deactivated or abandoned. The producer listed is the last known operator.

Some of the company names of producers designate subsidiary or divisional names, with notation of the parent company. Company addresses, from the Stanford Research Institute Directory and from the Thomas Register, are for the last known producer at a given location and are subject to the uncertainties introduced by acquisitions and name changes.

CLASS III ORGANIC CHEMICALS

	Location
ver Chem.	Buffalo, NY* Ashland, MA Toms River, NJ
or and Chem. ine	Ashland, MA Lock Haven, PA Lock Haven, PA* Deepwater, NJ St. Louis, MO*
h and Knowles	Fair Lawn, NJ Kalama, WA* Clifton, NJ*
hem. hem.	Kalama, WA Eddystone, PA Los Angeles, CA* Edison, NJ* Nixon, NJ* Fords, NJ* Garfield, NJ East Rutherford, NJ Chattanooga, TN*
	Midland, MI St. Louis, MI*
	Rochester, NY
	Rochester, NY
	Rochester, NY
	Rochester, NY
lliams	Deepwater, NJ* St. Bernard, OH* St. Bernard, OH*
	San Diego, CA*
	Rochester, NY
icide	Bound Brook, NJ Edison, NJ* Metuchen, NJ*
tta	Deepwater, NJ Sodyeco, NC* Luling, LA Sauget, IL*

TABLE A3. (continued)

Chemical	Producer	Location
<i>o</i> -Dichlorobenzene	Allied Chem. Products Dover Dow du Pont Hooker Monsanto Montrose Chem. Neville Chem. Olin PPG Solvent Chem. Specialty Organics Standard Chlorine	Syracuse, NY* Cartersville, GA* Dover, OH* Midland, MI Deepwater, NJ* Niagara Falls, NY* Sauget, IL Henderson, NV Santa Fe Springs, CA* McIntosh, AL* Natrium, WV Niagara Falls, NY Malden, MA* Irwindale, CA Delaware City, DE Kearny, NJ
3,4-Dichlorobenzaldehyde	Tenneco	Fords, NJ
3,4-Dichlorobenzotrifluoride	Tenneco	Fords, NJ
3,4-Dichlorobenzotrifluoride	Tenneco	Fords, NJ*
1,2-Dichloro-4-nitrobenzene	Blue Spruce Chem. Insecticide Martin Marietta Monsanto Plastifax	Bound Brook, NJ Edison, NJ* Metuchen, NJ* Sodyeco, NC* Sauget, IL* Gulfport, MS
3,4-Dichlorophenylisocyanate	Mobay Chem. Ott Chem.	New Martinsville, SC Muskegon, MI*
3,4-Difluoroaniline	Olin	Rochester, NY
<i>o</i> -Difluorobenzene	Olin	Rochester, NY
1,2-Dihydroxybenzene-3,5-disulfonic acid, disodium salt	Sterling Drug	New York, NY*
2,5-Dihydroxybenzenesulfonic acid	Eastman Kodak Nease Chem.	Rochester, NY* State College, PA*
2,5-Dihydroxybenzenesulfonic acid, potassium salt	Nease Chem.	State College, PA*
2,4-Dinitrophenol	Martin Marietta Mobay	Sodyeco, NC Bushy Park, SC
2,4-Dinitrophenoxyethanol	Hummel Chem.	Newark, NJ* South Plainfield, NJ

(continued)

TABLE A3. (continued)

Chemical	Producer	Location
3,5-Dinitrosalicylic acid	Eastman Kodak Hummel Chem.	Rochester, NY Newark, NJ*
	Salsbury Labs	South Plainfield, NJ* Charles City, IA
Fumaric acid	Allied	Buffalo, NY*
	Alberta Gas	Moundsville, WV*
	Hooker	Duluth, MN
	Monsanto**	Arecibo, PR
	Petro-Tex	St. Louis, MO
	Pfizer	Houston, TX*
	Reichhold	Terre Haute, IN
	Stepan Chem.	Morris, IL*
	Tenneco	Fieldsboro, NJ*
	U.S. Steel	Garfield, NJ Neville Island, PA
Hexabromobenzene	Velsicol	St. Louis, MI
	Dover	Dover, OH*
Hexachlorobenzene	Hummel Chem.	Newark, NJ*
	Stauffer	South Plainfield, NJ* Louisville, KY*
Hexafluorobenzene	PCR	Gainesville, FL
	Whittaker	San Diego, CA* Louisville, KY*
Maleic acid	Allied	Buffalo, NY*
		Marcus Hook, PA
		Moundsville, WV*
	Eastman Kodak	Rochester, NY*
	Pfanzstiehl Labs	Waukegan, IL
Maleic anhydride	Allied	Moundsville, WV*
	Amoco	Joliet, IL
	Asland	Neal, WV
	Chevron	Richmond, CA*
	Koppers	Bridgeville, PA
		Cicero, IL
	Petro-Tex	Houston, TX*
	Monsanto	St. Louis, MO
	Reichhold	Elizabeth, NJ
		Morris, IL
	Standard Oil of Indiana (see Amoco above)	
	Tenneco	Fords, NJ
	U.S. Steel	Neville Island, PA
<i>o</i> -Nitroanisole	du Pont	Deepwater, NJ
	Monsanto	Sauget, IL*
(continued)		St. Louis, MO

TABLE A3. (continued)

Chemical
2-Nitro- <i>p</i> -cresol
<i>o</i> -Nitrophenol
Pentabromochlorocyclohexane
Pentabromoethylebenzene
Pentabromotoluene
Pentachloroaniline
Pentafluoroaniline
<i>o</i> -Phenetidine
Phenol (from chlorobenzene)
1-Phenol-2-sulfuric acid, formaldehyde condensate
Phenyl ether
Phthalic anhydride
(continued)

TABLE A4. (continued)

Producer	Location	Chemical (class)
Fairmount Chem. Co., Inc. 117 Blanchard St. Newark, NJ 07105	Newark, NJ	2-Chloro-1,4-diethoxy-5-nitrobenzene (II)
Fritzsche Dodge and Olcott, Inc. 76 Ninth Av. New York, NY 10011	Clifton, NJ	Benzaldehyde (III)* Phenyl ether (III)*
GAF Corp. 140 West 51st St. New York, NY 10020	Rensselaer, NY	2-Chloro-1,4-diethoxy-5-nitrobenzene (II) 5-Chloro-2,4-dimethoxy-aniline (II) 4-Chlororesorcinol (II)
W. R. Grace and Co. 7 Hanover Square New York, NY 10005	Fords, NJ	Phthalic anhydride (III)*
Great Lakes Chem. Corp. Hwy. 52, Northwest West Lafayette, IN 47906	El Dorado, AR	Decabromophenoxybenzene (I) Tetrabromobisphenol-A (II)
Guardian Chem. Corp. 230 Marcus Blvd. Hauppauge, NY 11787	Hauppauge, NY	Chlorohydroquinone (II)* 2,4,6-Tribromophenol (I)
Hexcel Corp. 11711 Dublin Blvd. Dublin, CA 94566	Sayerville, NJ	Pentabromoethylbenzene (III)
Hooker Chem. Corp. 1900 St. James Place Houston, TX 77027 Subsid. Occidental Petroleum Corp.	Arecibo, PR Niagara Falls, NY	Fumaric acid (III) Phthalic anhydride (III) o-Dichlorobenzene (III)* Tetrachlorophthalic anhydride (III)* 1,2,4,5-Tetrachlorobenzene (III)* 1,2,4-Trichlorobenzene (III)* Phenol (III)*, ** Phenol (III)*, **
Hummel Chem. Co., Inc. P.O. Box 250 South Plainfield, NJ 07080	Newark, NJ South Plainfield, NJ	2,4-Dinitrophenoxyethanol (III)* 3,5-Dinitrosalicylic acid (III)* Hexachlorobenzene (III)* Picric acid (III)* 2,4-Dinitrophenoxyethanol (III) 3,5-Dinitrosalicylic acid (III)* Hexachlorobenzene (III)* Picric acid (III)* Sodium picrate (III)

(continued)

TABLE A4. (continued)

Producer	Location
ICC Industries See Solvent Chem.	
Inmont Corp. 1133 Av. of the Americas New York, NY 10036 Subsid. of Carrier Corp.	Carlisle NOTE listed ical acqui Inmo
International Mineral and Chem. Corp. IMC Plaza Libertyville, IL 60048	New
Kalama Chem. Co., Inc. The Bank of California Center Suite 1110 Kalama, WA	Kal
Kopper Co., Inc. Koppers Bldg. Pittsburgh, PA 15219	Bridge Chic Cice
Martin Marietta Corp. 6801 Rockledge Dr. Bethesda, MD 20034	Sod
Maumee Chem. Co. Presumed to be acquired by Sherwin Williams Address not available	St.
Mobay Chem. Co. Penn Lincoln Pkwy. West Pittsburgh, PA 15205	Nev
Monroe Chem. Co. Saville Av. at 4th St. Eddystone, PA Subsid. of Kalama Chem., Inc. (see Kalama)	Edd

(continued)

ATTACHMENT C

A-6

ORGANIC CHEMICAL PRODUCTION

Chemical (class)
2,4-Dichlorophenol (I)
3-Amino-5-chloro-2-hydroxy-benzenesulfonic acid (III)
Fumaric acid (III)
Maleic acid (III)
1-Phenol-2-sulfonic acid, formaldehyde condensate (III)
Phthalic anhydride (III)
Phthalic anhydride (III)
Phthalic anhydride (III)
Phthalic anhydride (III)
Fumaric acid (III)
Maleic acid (III)
Maleic anhydride (III)
<i>o</i> -Dichlorobenzene (III)
<i>o</i> -Anisidine (III)
3,4-Dichloroaniline (III)
1,2-Dichloro-4-nitrobenzene (III)
3,4-Dichloroaniline (III)
1,2-Dichloro-4-nitrobenzene (III)
<i>o</i> -Dichlorobenzene (III)
Maleic anhydride (III)
Phthalic anhydride (III)
1,2,4-Trichlorobenzene (III)
Phthalic anhydride (III)
Phthalic anhydride (III)
<i>o</i> -Dichlorobenzene (III)
Hexachlorobenzene (III)
1,2,4,5-Tetrachlorobenzene (III)
Tetrachlorobisphenol-A (II)
Tetrachlorobisphenol-A (II)
1,2,4-Trichlorobenzene (III)
1-Phenol-2-sulfonic acid, formaldehyde condensate (III)
Phenol (III)*
2,4,6-Tribromophenol (I)
Benzaldehyde (III)

TABLE A5. (continued)

Producer	Location	Chemical (class)
du Pont	Deepwater, NJ	4-Chloro-2-nitrophenol (III) <i>o</i> -Dichlorobenzene (III) 2-Nitro- <i>p</i> -cresol (III) <i>o</i> -Nitrophenol (III)
Eastern Chem. (Currently Eastern Chem. Div. of Guardian)	Pequannock, NJ	Chlorohydroquinone (II) 2,4,6-Tribromophenol (I)
Eastman Kodak	Rochester, NY	2,5-Dihydroxybenzenesulfonic acid (III) Maleic acid (III)
Fritzsche	Clifton, NJ	Benzaldehyde (III) Phenyl ether (III)
W. R. Grace	Fords, NJ	Phthalic anhydride (III)
Guardian	Hauppauge, NY Pequannock, NJ	Chlorohydroquinone (II) Chlorohydroquinone (II) 2,4,6-Tribromophenol (I)
Hooker	Niagara Falls, NY	<i>o</i> -Dichlorobenzene (III) Tetrachlorophthalic anhydride (III) 1,2,4,5-Tetrachlorobenzene (III) 1,2,4-Trichlorobenzene (III) Phenol (III)* Phenol (III)*
	North Tonawanda, NY South Shore, KY	
Hummel Chem.	Newark, NJ	2,4-Dinitrophenoxyethanol (III) 3,5-Dinitrosalicylic acid (III) Hexachlorobenzene (III) Picric acid (III) 3,5-Dinitrosalicylic acid (III) Hexachlorobenzene (III) Picric acid (III)
	South Plainfield, NJ	
Inmont (formerly Interchemical Corp.)	Carlstadt, NJ	3,5-Dichlorosalicylic acid (III)
Koppers	Chicago, IL Cicero, IL	Phthalic anhydride (III) Maleic anhydride (III)
Martin Marietta	Sodyeco, NC	2,6-Dibromo-4-nitrophenol (II) 3,4-Dichloroaniline (III) 1,2-Dichloro-4-nitrobenzene (III) Sodium picrate (III)

(continued)

MEMONEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

TO FILE DATE 26 AUG 1987
FROM CB ROBERT BERETSKY, HSMS IV, BUREAU OF PLANNING AND ASSESSMENT
SUBJECT HUMMEL CHEMICAL COMPANY, NEWARK, ESSEX COUNTY

The writer spoke with Mr. Bernard Shoen of the Hummel Chemical Company concerning their facility in Newark, Essex County.

According to Mr. Shoen, the company was located at 185 Foundry St., in Newark but has not operated at the site for approximately 25 years. Mr. Shoen stated the company may have leased building #18 but he was not certain. He also stated that approximately 90% of the operation at the Newark facility consisted of warehousing.

The writer also spoke with officials of the Norpak/KEM Realty Company which had owned the property in the mid 1960's. According to Mr. Corasi of Norpak, Hummel Chemical did lease property at 185 Foundry St., but they could not find any records stating what buildings Hummel may have occupied.

HS203:mz

Attachment B-1

ATTACHMENT D

MEMO

NEW JERSEY STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION

TO FILE DATE SEP 14 1987

FROM ROBERT BERETSKY, HSMS IV, BUREAU OF PLANNING AND ASSESSMENT

SUBJECT HUMMEL CHEMICAL COMPANY, NEWARK, ESSEX COUNTY

On 9/8/87, the writer spoke with Chief Busini of the Newark Fire Department concerning the subject facility. Chief Busini stated he spoke with fire inspectors who investigate the Foundry Street area but none of them have been with the fire department long enough to remember Hummel Chemical. Chief Busini then referred the writer to Newark Fire Department Engine 16 (201/733-7461) who are first responders to many fires. The writer spoke with Mr. Mertz of Engine 16 who stated he remembers Hummel Chemical being in the Foundry Street complex but does not know what buildings they occupied. Mr. Mertz also stated they responded to numerous fires and chemical spill incidents at the Foundry St. complex but he does not remember if any were at the Hummel Chemical facility.

HS203:mz

State of New Jersey

DEPARTMENT OF HEALTH

JOHN FITCH PLAZA
CN 360, TRENTON, N.J. 08625

February 8, 1982

Dr. Ramsey Christian
Compliance Officer
Hummel Chemical Company, Inc.
Harmich and Metuchen Roads
South Plainfield, New Jersey 07080

Dear Dr. Christian:

Enclosed please find a copy of our report on Hummel Chemical Company, Inc. It contains a brief description of the plant as well as an account of the two accidents which occurred in December of 1981. There are also recommendations included in the report, although they do not cover all areas of concern.

Andrew Rowland, an Occupational Health Specialist in our Program, will be contacting you to arrange health and safety training for your employees. We appreciate your cooperation and concern in this matter.

Sincerely,

Jerry Roseman
Program Specialist III
Occupational Health Program

JR/jmc

ATTACHMENT

Attachment C-1

SECTION I - INTRODUCTION

Following is a report which discusses three site visits conducted at Hummel Chemical Company during December of 1981. Also included are recommendations regarding engineering controls, work practices and employee education aimed at reducing potentially hazardous occupational exposures at the plant.

Hummel Chemical Company, Incorporated, is presently located in South Plainfield, New Jersey. Previously the plant was located in Newark, New Jersey. The warehouse at the South Plainfield site is approximately 25,000 square feet in size. Hummel employs between 15 and 20 people. The company operates primarily as a chemical wholesaler; that is, a number of different chemicals are bought in relatively large quantities and are subsequently resold in smaller amounts, often with little or no processing. Sometimes, however, Hummel Chemical mixes, sifts, screens, mills or reacts chemicals in order to produce a desired product. The greatest potential for hazardous occupational exposures exists during these operations.

SECTION II - BACKGROUND

Hummel Chemical Company, Incorporated, is a small chemical wholesaler which engages in chemical processing to a limited degree. Most of the processing is mixing, milling and screening a variety of materials. A small percentage of production involves reacting chemicals such as hexachlorobenzene, hydrazine and others to produce contracted compounds.

There are a number of toxic chemicals on site at Hummel Chemical. Many of these pose a serious fire and/or explosion hazard as is evidenced by the history of such incidents at the South Plainfield Plant. Since

Hummel has been operating in South Plainfield for many years. There have been eight fires and one explosion reported. Most of the fires seem to be associated with similar causal conditions. There are many chemicals in the plant that are strong oxidizers. These include potassium nitrate, sodium nitrate and ammonium perchlorate, among others. Hummel also stores a number of organic chemicals, which can act as fuels. The fire and explosion hazards arise when an oxidizer comes in contact with a fuel in the presence of a spark, flame or some other ignition source. At Hummel, it appears that many of the fires started in those areas of the plant where the milling, mixing or screening of oxidizing materials are performed.

The two most recent accidents at the plant occurred on 12/1/81, and on 12/3/81. On 12/1/81 there was a fire at Hummel Chemical Company in which one employee was injured. Two days later there was an explosion at the plant. No one was injured in the second accident, although parts of the building suffered significant structural damage. According to South Plainfield Fire Chief John Cotone, the fire department is developing recommendations for Hummel Chemical to reduce the potential fire and explosion risks at the plant.

The Occupational Health Program was made aware of the situation at Hummel Chemical Company by Robert Kunze, Middlesex County Occupational Health Inspector. Mr. Kunze and the South Plainfield Fire Department, as well as the New Jersey Department of Environmental Protection's Hazard Management Unit, responded to both accidents.

According to company statements the operation that was being performed at the time of the 12/1 fire involved the screening of a product called SDR. SDR is a mixture of potassium nitrate, charcoal and sulfur. Ramsey Christian, the firm's compliance officer, informed us on our first visit to the plant on 12/10/81 that the exact cause of the fire was unknown; however, he felt that during the screening process a more active mixture than the one they were attempting to produce may have inadvertently formed. It was this "active mixture"

which could have been ignited if a spark was produced by dragging one of the steel rimmed drums across the concrete floor. On 12/3/81, Hummel Chemical Company was again the scene of an accident. This time an explosion occurred as the result of a reaction between chlorodinitrobenzene and ethylene glycol, which was being carried out in a 150 gallon stainless steel jacketed reactor. The material produced by the reaction of these two chemicals was dinitro-phenoxyethanol, a plasticizer used in rocket motor fuel. Again, Hummel representatives stated that they had been unable to discover the reasons for the accident.

SECTION III - DESCRIPTION OF PLANT OPERATIONS AND HAZARDS

The fire that occurred on 12/1/81 started in the "pit area" of the plant. Two types of operations are carried out in the pit area - milling and screening/sifting. Both processes are similar in that a powdered or crystalline raw material is poured through a screen in the floor of the upper level in the area. It then passes through a cloth tube before entering either the milling or screening/sifting machinery. After processing, the refined product is collected in fiber drums which are then sealed and prepared for shipment.

On 12/10/81 and 12/21/81 I, along with Middlesex County Health Inspector Robert Kunze, identified a number of potentially hazardous conditions at the plant. There was inhalation hazard posed by high concentrations of dust in the air of the pit area. We also experienced irritation to the skin, eyes and mucous membranes by certain chemicals (eg. potassium nitrate). There is also a potential risk of fire and/or explosion if high concentrations of oxidizers in the room air come into contact with a "fuel" in the presence of ignition source. In addition, there were potential health hazards associated with high noise levels and by the storage and handling of highly toxic and, in some cases, carcinogenic chemicals.

On 12/21/81, Hummel Chemical Company was engaged in the milling of pure potassium nitrate using the process described above. Two employees, one on the upper level and the other in the pit area, were responsible for the operation being performed. As the employee on the upper level slit open the bags of powdered potassium nitrate and poured it through the screen in the floor, large clouds of dust were evolved. As the potassium nitrate passed from the cloth tube into the milling machine clouds of dust again escaped into the workroom air. Finally, on the floor of the pit area where the second employee stood with the fiber drums to be filled, large quantities of dust covered the floor and contaminated the entire area. All walking - working surfaces were coated with dust. Both Robert Kunze and I experienced coughing and choking and a burning sensation to the skin, due to the concentration of potassium nitrate dust in the air. We were observing the operation from the warehouse where a number of highly toxic organic chemicals are stored. That the dust was present in the warehouse as well as the pit area is a source of concern.

SECTION IV - RECOMMENDATIONS

We feel that the employees at Hummel Chemical Company face a potentially hazardous situation. This judgement is based on the following factors: (1) A history of fires at Hummel Chemical Company; (2) Poor workpractices and housekeeping at the South Plainfield plant; (3) High dust concentrations in the pit area of the plant which may pose a health hazard as well as a fire hazard; (4) Employee exposure to high noise levels; (5) The lack of adequate ventilation or other engineering controls as a mechanism for reducing dust levels; (6) The lack of protective equipment worn by employees; and (7) The lack of effective worker education at Hummel Chemical Company.

It is hoped that the following recommendations, when implemented, will

begin to minimize the health and safety hazards faced by employees at Hummel Chemical Company. These recommendations do not represent a final or a comprehensive effort at correcting all the problems discussed in this report. Hummel Chemical Company should work with a qualified ventilation engineer in order to develop engineering controls based on the recommendations made in this section. Only with the help and cooperation of Hummel Chemical Company can we completely address and correct the wide range of health and safety problems which exist at the plant.

- (1) In order to minimize dust exposure to employees who are pouring chemicals through the grating in the floor of the upper level of the pit area, a portable canopy-type enclosure arrangement should be used to enclose the floor screening. The hood should include a slot into which a knife blade is mounted and which would be used to slit open the bags of material.
- (2) Consideration should be given to replacing the cloth tube used during milling operations with tubing material that would not retain large amounts of dust. This material, possibly plastic, should form a dust tight seal with any equipment it feeds into.
- (3) Another source of high dust exposure occurs as the material passes from the milling machinery into drums. There are a number of different types of drum hoods connected to a local exhaust system leading to a bag house which would be appropriate.
- (4) In consultation with a ventilation engineer it might prove feasible to design a ventilation system which encloses the entire milling and drum-filling operation. We could work with Hummel in contacting a consultant and in designing an acceptable system.
- (5) Drums should be made of materials that are flame resistant. To prevent the build-up of static electrical charges, drums, especially those with metal or plastic rims, should not be dragged across the workroom floor. A handtruck could be used to move the drums.

* Enclosed find copies of diagrams on bag filling and barrel filling operations from the "Industrial Ventilation Manual." Hopefully these can serve as illustrations of the types of designs which you could adopt.

- (6) All tools, including shovels, used in the pit area of the plant should be composed of non-sparking alloys such as beryllium or copper. A listing of local manufactures of such tools is attached.
- (7) If the Portasifter will be used to sift materials directly into drums, a gasket of some type must be used to provide a dust-proof seal. In order to minimize ~~dust~~ exposures to employees engaged in pouring chemicals through the sifter a hood arrangement similar to the one discussed in (1) of this section could be used.
- (8) Employees who work in the pit area performing milling and sifting operations should wear approved NIOSH respirators equipped with the proper filtering medium. They should also wear gloves and protective goggles. The health department can provide a listing of approved equipment.
- (9) Employee education should be conducted at Hummel Chemical Company covering such issues as exposure to toxic substances, the risk of fire and explosion in the pit area, the importance of personal protective equipment and other relevant topics.

The above recommendations are by no means exhaustive and deal primarily with the fire and explosion risks which exist at the plant. Further investigation and discussion need to be conducted with representatives of Hummel Chemical Company in order to effectively address some of the other potential health and safety problems faced by Hummel employees.

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AND NATURE DEVELOPMENT

DIVISION OF WATER POLICY
AND SUPPLY



SPECIAL REPORT NO. 28

GROUND-WATER RESOURCES OF
ESSEX COUNTY, NEW JERSEY

Prepared in cooperation with
United States Department of the Interior
Geological Survey

1968

ATTACHMENT F

Attachment F-1

volume of void to the total volume of unconsolidated sediment is considerably greater than the ratio of the volume of fracture openings to the total volume of rock. The interstitial openings in clays and silts are so small, however, that they restrict the movement of water, even though the percentage of void space may be great.

WATER-BEARING PROPERTIES OF MAJOR GEOLOGIC UNITS

Consolidated Rocks

Rocks of the Brunswick Formation are the main source of ground water in Essex County. The shales and sandstones are generally capable of sustaining moderate to large yields to wells. The Watchung basalt commonly is capable of yielding only small to moderate quantities of water.

Water in these rocks occurs under both unconfined and confined conditions. Unconfined ground water occurs mainly in the upland areas where overlying unconsolidated deposits are thin or absent. Confined and semi-confined ground water conditions exist in lowland areas in Newark, parts of Fairfield, and along the Passaic River where clay beds in the unconsolidated Quaternary deposits mantle the underlying rocks. Wherever such confinement occurs, water beneath the relatively impermeable confining layers is commonly under artesian pressure. In many areas, such as parts of Fairfield and in the northern part of the county, water in wells tapping the confined aquifers will rise above the top of the aquifer and sometimes near or above land surface. In areas subjected to heavy pumping, such as the Newark area and western Millburn Township, the artesian pressure may be considerably reduced. Parts of the confined aquifer may even become dewatered as has happened in part of Newark, in which case the water remaining in the aquifer is no longer confined.

Confined ground water is also encountered in the shales and sandstone directly beneath the basalt flows in the western part of the county down-dip from the outcrop area. Confined or semiconfined ground-water conditions may occur in some areas because of differences in permeability within the rock layers resulting from variations in fracturing or weathering or a combination of both.

Some of the various systems of joints and fractures in the consolidated rocks intersect so that water can move vertically as well as horizontally and zones of high secondary porosity are then interconnected. Most wells tapping these rocks draw water from more than one water-bearing zone. However, these zones in the Brunswick Formation have not yet been accurately defined. They are certainly within the first 600 feet below land surface, and for most practical purposes are probably within the first 400 feet. The best producing wells in the Brunswick Formation in

Essex County are for the most part between 300 and 400 feet deep. Nevertheless, the lack of any precise known boundaries makes it difficult to determine the optimum depth to which a well should be drilled in any given location. Also it is impossible to predict the yield of a proposed well except in very general terms based on the average yield of other wells in the area.

Two pumping tests, both at the same locality, were conducted by the U. S. Geological Survey in January 1949 on wells tapping the Brunswick Formation in Essex County. The wells (owned by P. Ballantine and Sons, Newark), shown on figure 5, were selected to provide the best possible spread of observation wells in as many directions as possible. As the results of the tests have been reported by Herpers and Barksdale (1951, p. 28-31) they will be only summarized here.

In the first test, the centrally located well 1-1 was pumped and water levels were observed in the seven surrounding wells indicated on figure 5. Well 11-9 was pumped during the second test and the same wells were used to observe water levels. In both tests, observation wells lying along the strike of the Brunswick Formation with respect to the pumping well showed the greatest drawdown. When well 1-1 was pumped, there was a prompt and distinct decline of the water level in observation well 11-8. When well 11-9 was pumped, the water level in observation well 11-10 responded promptly and distinctly. No significant response was seen in observation wells aligned in directions other than along the strike during either test.

In these tests, as well as in several others conducted, it is invariably noted that aquifers in the sedimentary rocks of Triassic age of northern New Jersey are anisotropic, that is, they do not transmit water equally in all directions (Vecchioli, 1967). The greatest drawdowns are observed in those wells aligned along the strike of the sedimentary layers with respect to the pumping well. The least amount of drawdown is observed in observation wells that are located transverse to the strike. These observations have been interpreted to indicate that water moves more readily along joints and fractures which strike parallel to the strike of the bedding than along joints and fractures which strike in other directions. It is useful, when planning future well locations, to know the direction in which wells will interfere most with each other and with existing wells. In general, wells should be spaced far apart along the direction of strike (approximately N 30° E for most of Essex County) because it is in this direction that the greatest interference occurs. They may be placed closer together perpendicular to the strike since interference is less in that direction.

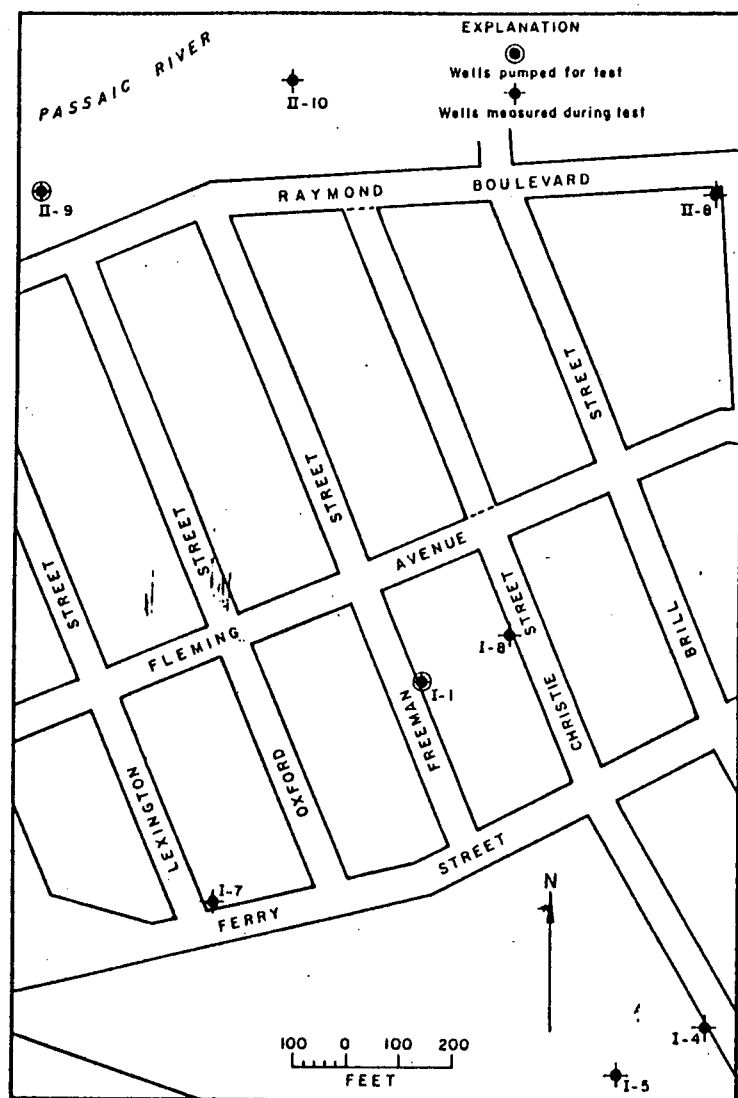


Figure 5.—Location of wells at plants of P. Ballantine and Sons, Newark, N. J., used during pumping tests in January 1949 (after Herpers and Barksdale, 1951, fig. 3, p. 30).

Well Yield and Specific Capacity

Yields of 35 large diameter public-supply, industrial, and commercial wells tapping the Brunswick Formation range from 35 to 820 gpm (gallons per minute) (Table 2) and average 364 gpm. The distribution of the yields is as follows:

Yields	No. of wells
0-150	4
151-300	12
301-500	12
> 500	7

Depths of the same wells in the Brunswick Formation range from 115 to 856 feet; the average depth is 381 feet. Specific capacities of the 35 wells range from 0.21 to 70.00 gpm per foot of drawdown and average 11.07 gpm per foot of drawdown.

Wells tapping the Watchung Basalt commonly produce small to moderate quantities of water. Yields of 26 wells range from 7 to 400 gpm (Table 2) and average 116 gpm. The distribution of the yields is as follows:

Yields	No. of wells
0-100	15
100-199	5
200-300	5
> 300	1

Specific capacities of wells in the basalt range from 0.05 to 5.66 gpm per foot of drawdown and average 1.74 gpm per foot of drawdown. Several moderate to high yielding public supply and industrial wells have been developed in the Essex Fells-West Caldwell-Fairfield area. These higher yields may be the result of increased fracturing of the basalt which has been slightly folded in this area.

Figures 6, 7, and 8 are specific capacity cumulative frequency distribution graphs for wells in the Brunswick Formation in Essex County. In figure 6, specific capacities are grouped on the basis of well depth. Wells drilled between 300 and 399 feet deep appear to have consistently higher specific capacities than wells of other depths (fig. 6). This relationship suggests that the best water-bearing zones in the Brunswick Formation will be

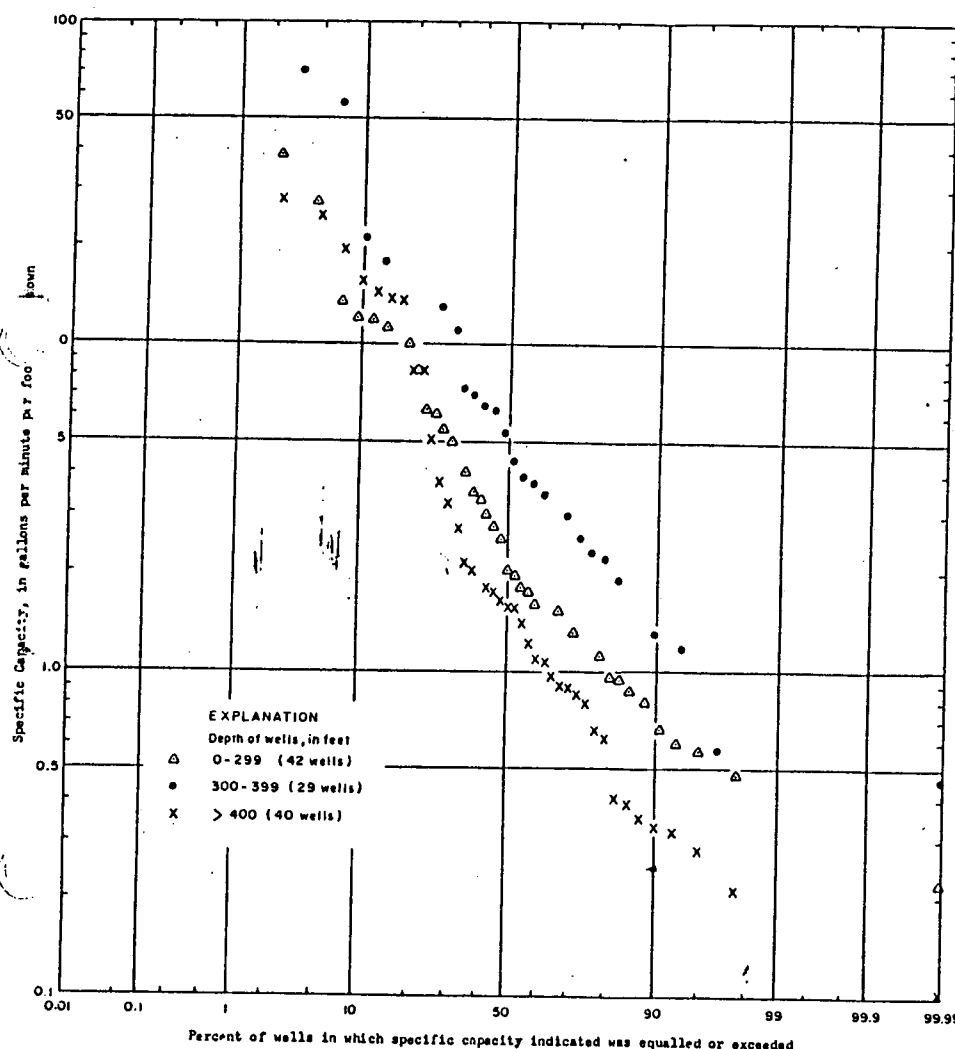


Figure 6.—Cumulative frequency distribution of specific capacities of wells penetrating the Brunswick Formation grouped according to depth.

encountered between depths of 300 and 400 feet and that significantly greater quantities of water generally will not be obtained by drilling below 400 feet. The specific capacities of wells grouped according to geographic area are shown in figure 7. These areas divide Essex County into three strips which are approximately parallel to the strike of the Brunswick Formation. The eastern strip is further divided into a northern part covering Belleville, Bloomfield, Glen Ridge, and Nutley, and a southern part covering East Orange, Irvington, and Newark. From this graph it readily can be seen that wells in Maplewood, Montclair, Orange, South Orange, and West Orange, have generally higher specific capacities than wells in other parts of Essex County. The wells in these communities are located in the area immediately east of First Watchung Mountain. In figure 8, specific capacities are related to well diameter. As should be expected, larger diameter wells have higher specific capacities.

Quality of Water

Except for hardness-forming constituents and local salt-water contamination, water from the Triassic rocks commonly does not contain objectionable concentrations of any chemical constituents throughout most of the county (Table 3). The hardness of water ranges from 104 ppm (parts per million) to 273 ppm. In the Newark area, salt-water contamination has seriously impaired the quality of ground water and chloride concentration are as high as 1,900 ppm.

Ground water has high chloride concentrations in areas of relatively heavy pumpage in eastern Newark adjacent to Newark Bay and the Passaic River. By 1900, water levels in these areas, notably in the southeastern section, were considerably below sea level (fig. 9). The major pattern of ground-water development had changed slightly by 1960. More significant however is the extent to which water levels had been lowered below sea level and the increase in the size of the area affected by 1960 (fig. 10). Heavy ground-water withdrawals have lowered the general water level in these areas (fig. 10), reversing the natural gradient between the ground- and surface-water bodies, and have induced a flow of salt water from the river and bay into the underlying water-bearing formations. A water sample collected in 1879 from a well owned by the Celluloid Works, located in this part of Newark, contained only 6.2 ppm chloride. In 1948, water with 1,900 ppm chloride was collected from a well in the same area owned by P. Ballantine and Sons. A probable contributing factor in salt-water intrusion is the dredging of ship canals in Newark Bay and the Passaic River. In deepening these canals, semi-pervious Recent and Pleistocene sediments were removed which had acted as an imperfect barrier to the infiltration of salt water.

ATTACHMENT-47

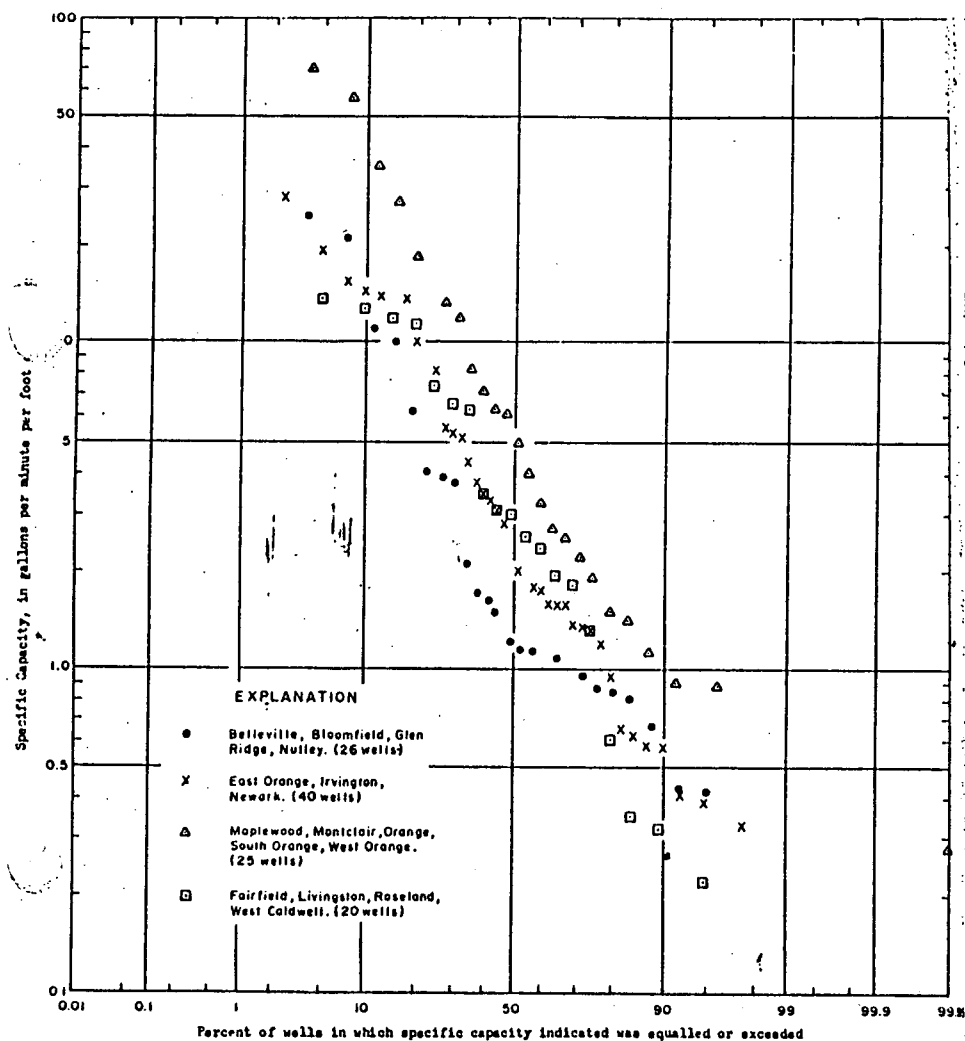


Figure 7.—Cumulative frequency distribution of specific capacities of wells penetrating the Brunswick Formation grouped according to geographic area.

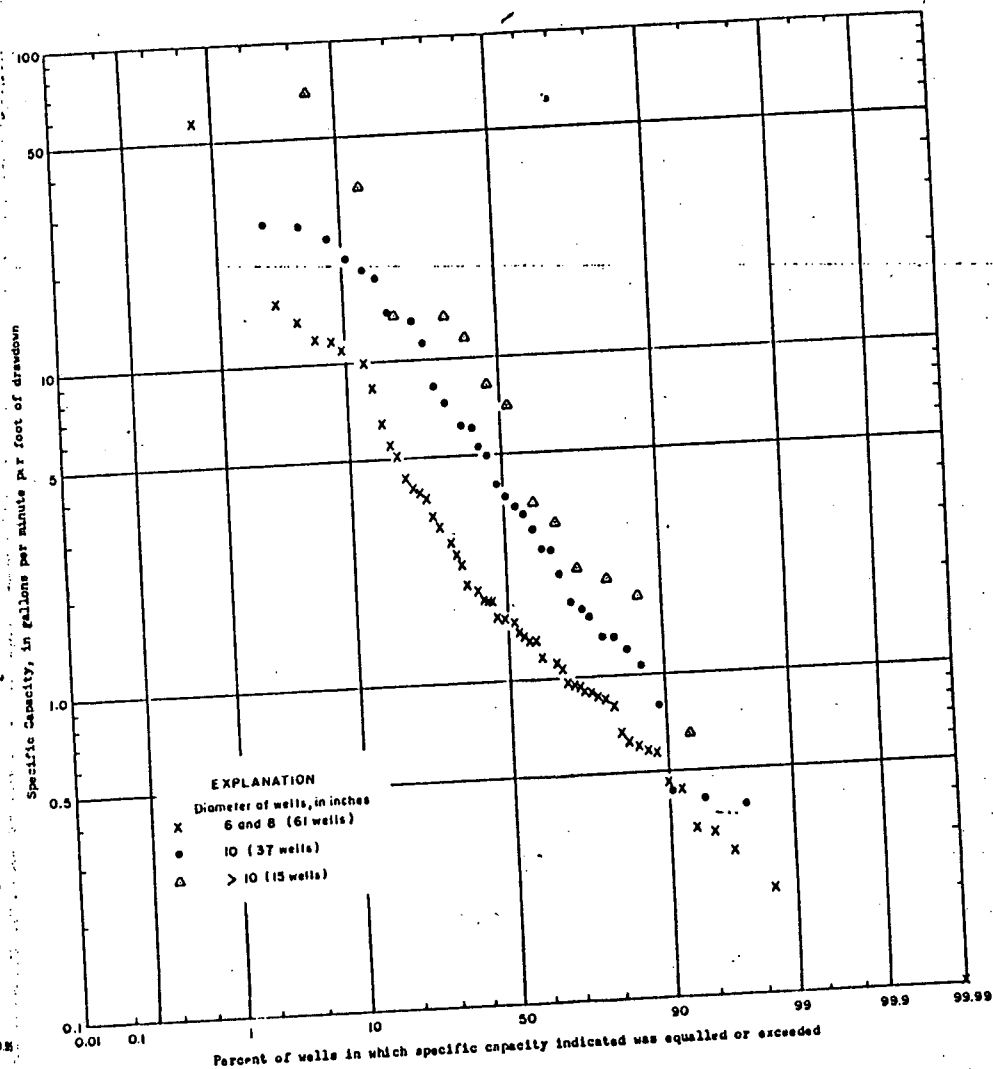


Figure 8.—Cumulative frequency distribution of specific capacities of wells penetrating the Brunswick Formation grouped according to well diameter.

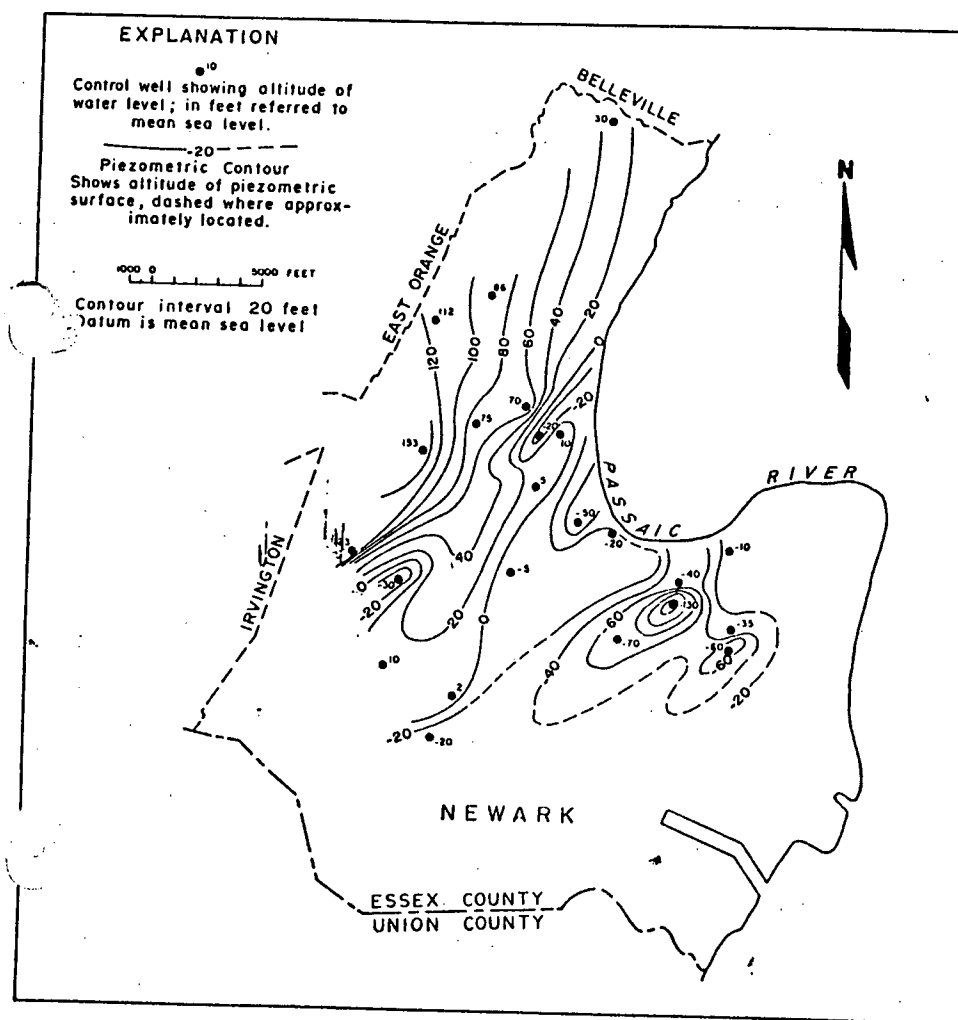


Figure 9.—Generalized piezometric contours for the Brunswick Formation in the Newark area based on water levels in wells drilled between 1890 and 1900.

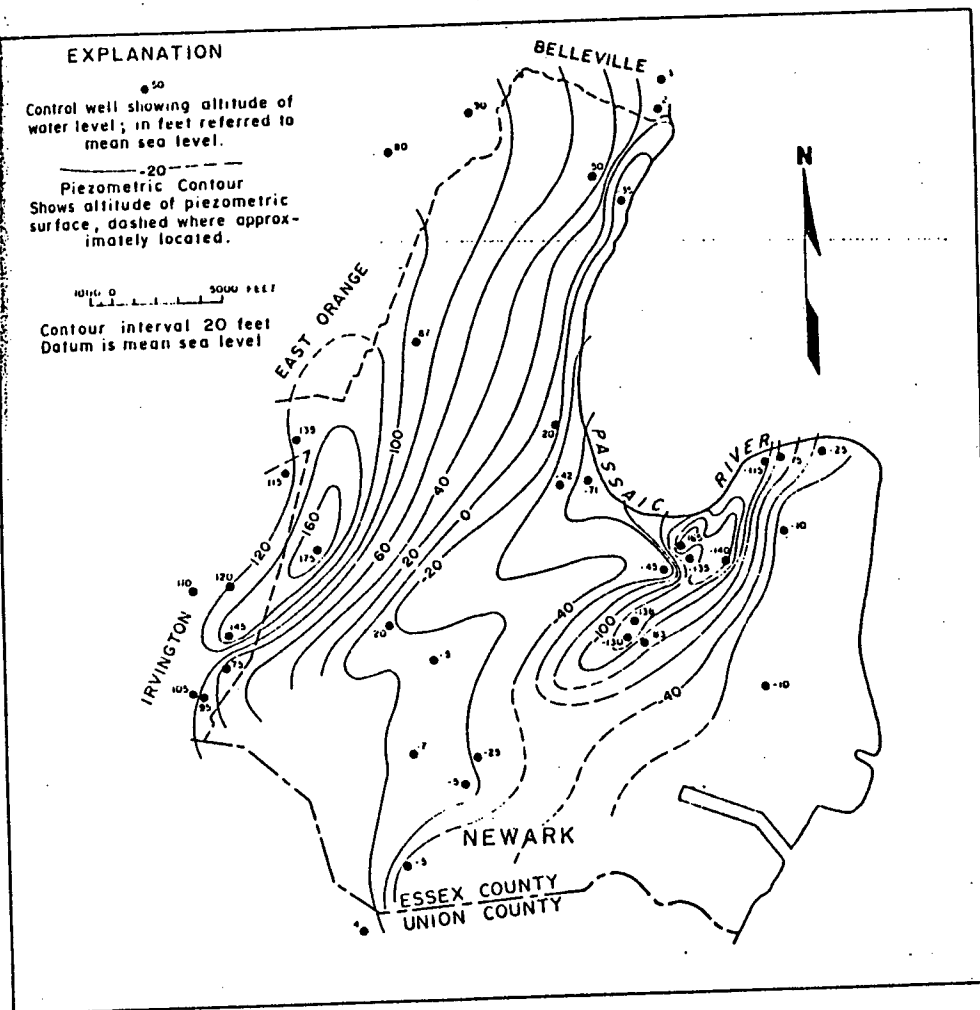


Figure 10.—Generalized piezometric contours for the Brunswick Formation in the Newark area based on water levels in wells drilled between 1950 and 1960.

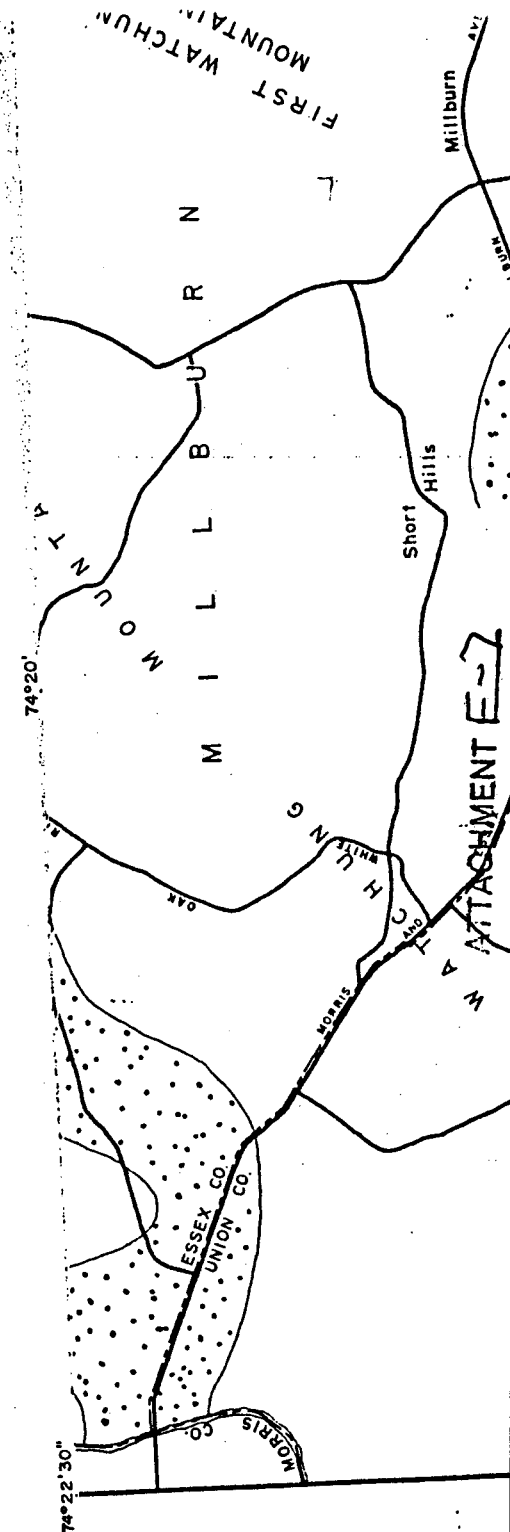
Salt-water contamination of the Brunswick Formation in the Newark area has been investigated by Herpers and Barksdale (1951). Their study was based on analyses of water samples collected in 1942 by the city of Newark. More recent analyses suggest there has been additional encroachment of saline water since 1942 throughout the problem area. In 1942, water from the Wilbur Driver Company's well No. 2 along the Passaic River in northern Newark contained 72 ppm chloride. In 1961, water from this same well contained 330 ppm chloride. Water from a well drilled by Mutual Benefit Life Insurance Company, 520 Broad Street, in 1965 contained 1,145 ppm chloride. Samples collected from other wells in this area contained less than 500 ppm chloride in 1942.

Pleistocene Deposits

Unconsolidated sediments of Pleistocene age mantle the bedrock throughout much of Essex County (fig. 3). They consist of clay, silt, sand, gravel, and boulders and can be divided into two general categories—stratified drift and unstratified drift. Only sand and gravel aquifers in stratified drift deposits contain sufficient quantities of water to warrant discussion of their water-bearing properties.

Water in the stratified drift occurs under both unconfined (water table) and confined (artesian) conditions. Unconfined ground water occurs where sand and gravel deposits are not covered by clay, silt, or glacial till and are exposed at the surface. The distribution of these deposits is shown on figure 3. For the most part however, these sand and gravel deposits do not yield large quantities of water as they are commonly less than 20 feet thick and are not areally extensive. The unconfined aquifers are recharged directly from precipitation on the outcrop area. Confined and semiconfined ground water occurs where sand and gravel deposits have been covered by lake clay or silt, or by glacial till. These deposits are largely confined to the buried valley so they are not visible on the surface and their regional extent and distribution are therefore not readily apparent. The confined and semiconfined aquifers are recharged by leakage through overlying confining beds and by precipitation falling on outcrop areas outside Essex County. Some recharge may also be derived from the underlying and adjacent Brunswick Formation.

The most productive artesian and semi-artesian aquifers in the stratified drift in Essex County occur as valley fill in stream valleys that were cut in the bedrock before the last glaciation. Consequently the size, shape, and distribution of the aquifers conform to the size, shape, and distribution of the bedrock valleys. The bedrock valley underlying the Newark area (shown on fig. 4) is filled with till and clay, and contains only minor amounts of water-bearing sand. Extensive subsurface exploration in western



Essex and eastern Morris Counties has demonstrated that the valley-fill aquifers in Essex County are part of an extensive valley-fill aquifer system underlying much of these two counties (Vecchioli and others, 1968). Figure 11 shows the known distribution of valley-fill aquifers in western Essex County.

The most highly developed part of the valley-fill aquifer system is in western Millburn and southwestern Livingston. Four well fields tapping the Pleistocene sand and gravel are located in an area of less than $\frac{1}{4}$ square miles. During 1965 an average of 13.6 mgd (million gallons per day) was pumped from these fields. Such continued heavy development has, naturally, lowered water levels in the aquifer. In 1925, the depth to water in the Canoe Brook well field of Commonwealth Water Company was about 30 feet below land surface. By 1965, the average depth to water in the same field had dropped to 83.5 feet below land surface.

Figure 12 shows the annual mean depth to water in the Commonwealth Water Company's Canoe Brook well field for the 20-year period 1947 to 1966. The water level has declined almost continuously since 1947. This is due in large part to increased demands placed on the adjacent Canoe Brook well fields of the Commonwealth Water Co. and East Orange Water Dept. for most of the period 1947 to 1961. Commonwealth Water Company's Passaic River well field was put into service in 1956 and although the demands on their Canoe Brook field were lessened, the combined pumpage (not shown) continued to increase. However, in spite of the fact that from 1961 to 1966 pumpage from the Commonwealth and East Orange Canoe Brook fields decreased, the water level in the Commonwealth Canoe Brook field continued to decline (fig. 12). Several factors probably have caused this continuing lowering of water level. The Passaic River well field taps the same aquifer and withdrawals there have undoubtedly had some effect on area water levels. In addition, Commonwealth's Canoe Brook well field area has had below average rainfall for 12 of the 13 years since 1953 with a consequent reduction in the amount of available recharge. The reduction in recharge together with increased demands during extended dry periods, especially from 1961 to 1966, have contributed to the steady decline of the water level in the aquifer.

Aquifer tests on the stratified drift deposits have been conducted by the U. S. Geological Survey at two localities in Essex County and at several places in Morris County. The reliability of the results of these tests are questionable for the following reasons: (1) the aquifers are not areally extensive; (2) it is impossible to control or eliminate outside interference; (3) it is seldom possible to establish pre-test water-level

F-8
ATTACHMENT

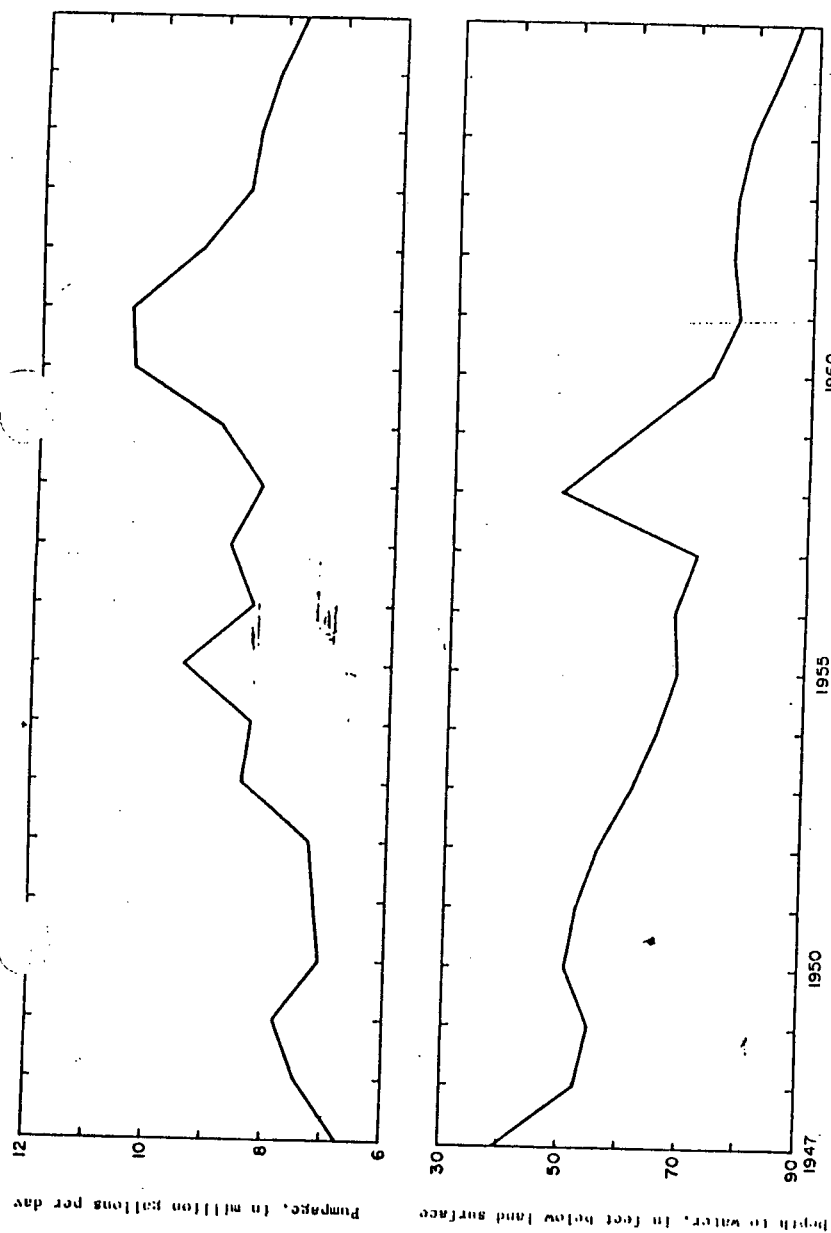


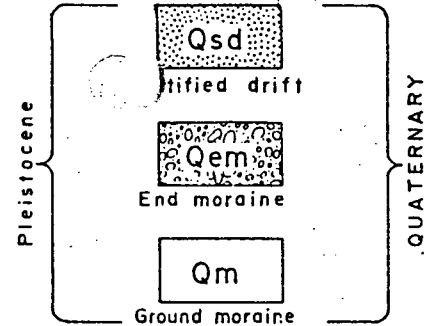
Figure 12.—Depth to water in the Commonwealth Water Company Canoe Brook well field and ground-water pumpage from the Commonwealth Water Company and East Orange Water Dept. Co.

trends; and (4) observation wells commonly are insufficient in number or not properly located. It is therefore difficult to apply average figures for permeability, transmissivity, and the coefficient of storage to the valley fill aquifer and then use these figures to determine long-range effects of pumpage throughout the aquifer system. Each area must be evaluated in context with the numerous variables by which it is affected.

Stratified drift deposits are the most productive aquifers in Essex County. Yields of 27 large-diameter wells tapping these deposits range from 410 gpm to 1,593 gpm (table 2) and average 908 gpm. The distribution of the well yields is as follows:

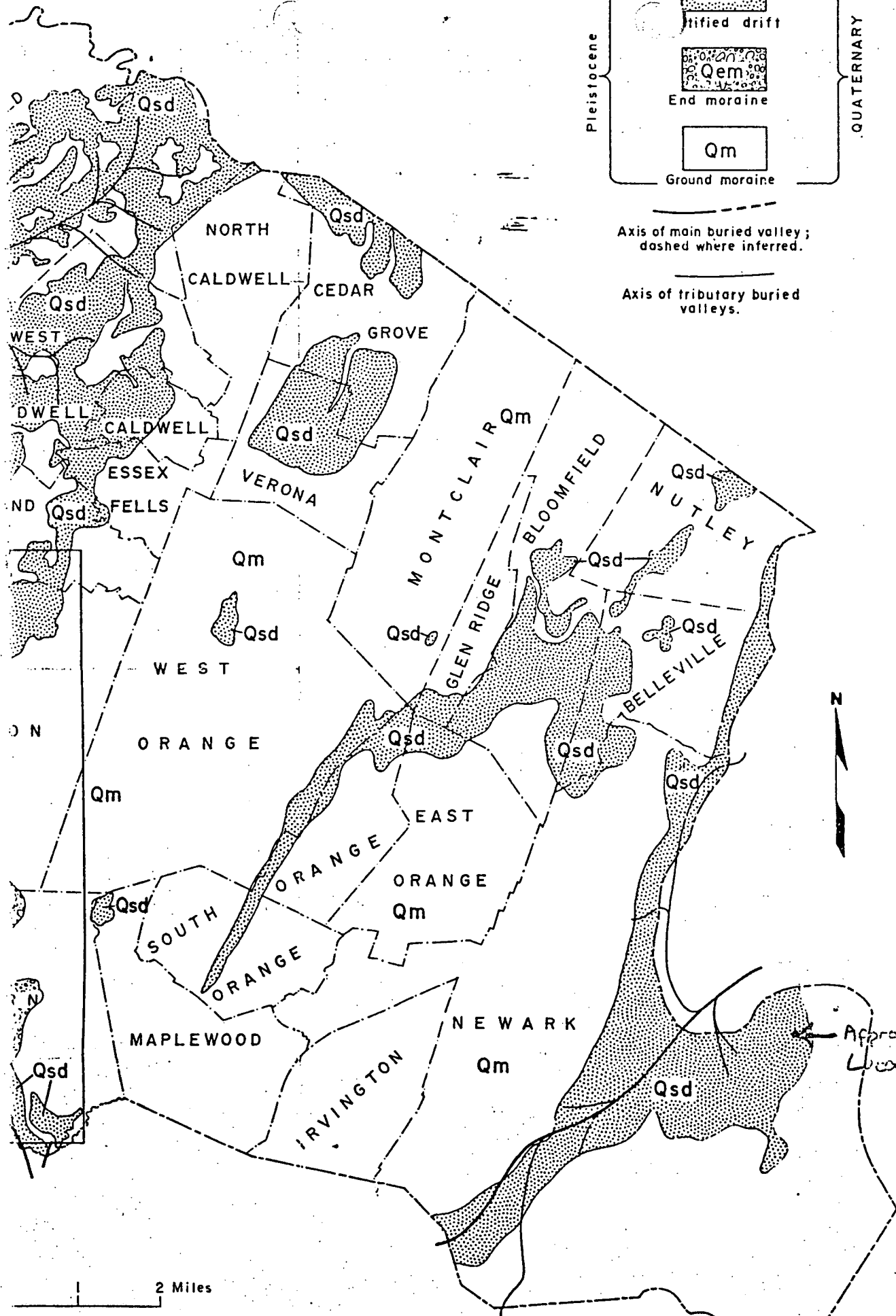
<u>Yields</u>	<u>No. of wells</u>
<500-gpm	3
501- 800 gpm	11
801-1,200 gpm	9
>1,200 gpm	4

Water from the stratified drift deposits ranges in hardness from 104 ppm to 212 ppm (table 3). Most of the samples analyzed had sulfate concentrations of 40 ppm or less, chloride concentrations of less than 11 ppm, and nitrate concentrations of 3 ppm or less. However, water from one well in Essex Fells had chloride and nitrate concentrations of 28 ppm and 6.4 ppm, respectively, and water from two wells in Millburn had sulfate concentrations of 67 ppm and 77 ppm. The higher concentrations of these constituents suggests a low-grade pollution problem, probably resulting from either sewage or the use of chemical fertilizers in the area. Manganese concentrations slightly in excess of the Public Health Service's recommended maximum limit of 0.05 ppm occur locally in the Commonwealth well field.



Axis of main buried valley;
dashed where inferred.

Axis of tributary buried
valleys.



N

2 Miles

Approximate Site Location

ATTACHMENT F



State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE MANAGEMENT

Michele M. Putnam
Deputy Director

John J. Trela, Ph.D., Director
401 East State St.
CN 028

Lance R. Miller
Deputy Director

Hazardous Waste Operations

Trenton, N.J. 08625-0028
(609)633-1408

Responsible Party Remedial Action

M E M O R A N D U M

TO: Richard Gervasio, Supervisory Environmental Technician
Bureau of Planning and Assessment

FROM: Robert Beretsky, HSMS III CB
Bureau of Planning and Assessment

SUBJECT: SAMPLING PLAN FOR THE HUMMEL CHEMICAL
(AKA: 185 FOUNDRY STREET) SITE

DEC 14 1988

PROPOSED DATE OF SAMPLING: October 14, 1988

PURPOSE:

To characterize contaminants present at the site and determine the hazards these contaminants pose to public health and the environment.

COMMENTS:

The Hummel Chemical Company formerly processed a variety of chemicals at a small industrial complex located at 185 Foundry Street in Newark from the mid-1950's to the mid-1960's. Although the exact nature of Hummel's operations at the Foundry Street site are unknown, it appears most of the processing occurred through mixing and blending of powdered chemicals. Some of the chemicals reportedly used by Hummel are considered Class III Dioxin precursors. It is unknown exactly what building(s) Hummel may have occupied at the Foundry Street complex.

The Foundry Street complex is comprised of approximately 30 buildings, many of which currently and formerly housed chemical related industries. Former operators at this site include the Arkansas Chemical Company, Coronet Chemical Company, Diamond Shamrock, Essex Chemical Company, and Honig Chemical. Current occupants include the Sun Chemical Company, Conus Chemical, Avon Drum and Automatic Electroplating.

Most of the buildings are in close proximity, separated only by small alleyways. The alleyways throughout the site are bisected by common storm drains which receive contaminated runoff and, in some instances, direct discharges from the various industries. Samples collected from one, of the storm drains near the Sun Chemical Company as part of Sun Chemicals ECRA submittal revealed high concentrations of volatile organics. Since the storm drains are common to all the industries and due to the long history of industrial use at this site, it is difficult to assess which industries are the actual contributors to contamination in the drains.

Although most of the site is covered with concrete or asphalt, there are many exposed surfaces which are stained from spills and leaks of chemicals. Much of the "covered" areas are cracked or consist only of cobblestone thereby permitting any spills to migrate to the soil.

A presampling assessment conducted by NJDEP personnel on October 7, 1988 revealed most of the exposed soil surface is stained and appears to be saturated with chemicals. Pools of multi-colored chemicals were observed in many areas throughout the site. Poor housekeeping practices appear to be commonplace by almost all industries within the complex. Drums of hazardous substances were being stored throughout the site in insecure areas which lacked adequate secondary containment. Many of the drums were leaking and insecure.

Soil gas readings were recorded throughout the site using an HNu photoionization detector and an OVA flame ionization detector. Readings obtained on the HNu ranged from background (0.6 ppm as benzene) to over 600 ppm as benzene; those on the OVA ranged from 10 ppm as methane to over 1000 ppm as methane. Ambient air readings ranged from background to 40 on the HNu and from background to over 10 on the OVA.

Based on information obtained during the presampling assessment, further investigation of the site is warranted. Since the exact location of Hummel Chemical within the Foundry Street Complex cannot be discerned and due to the close proximity of the various industries to one another, the entire complex will be treated as one site.

SECTION A: QA/QC SAMPLES:

One trip blank to be analyzed for volatile organic chemicals and one field blank to be analyzed for substances included on the Hazardous Substance List + 30 peaks (HSL + 30) will be prepared for QA/QC purposes.

The trip blank will be filled with demonstrated analyte free water at Weston Labs prior to shipment to the Bureau of Planning and Assessment and will not be opened until it arrives back at the lab with the other samples. This sample will serve as a quality control to ensure contaminants are not being transferred between containers during shipment, nor occurring as a result of laboratory contamination.

The field blank will be prepared by pouring demonstrated analyte free water through a lab cleaned teflon bailor into sample bottles provided by Weston Labs. This sample serves as a quality control of the sample collection procedures and the equipment cleaning process ensuring contaminants are not being transferred to the sample via the sample collection equipment.

A Performance Evaluation (PE) dioxin sample will be obtained from the NJDEP/Bureau of Environmental Laboratories and shipped to Weston Analytical Laboratories with the dioxin samples collected on site. This sample will be used to determine the proficiency of the labs analytical procedures for dioxin analysis.

Lastly, a total of four additional environmental samples will be collected, two for each environmental media sampled (soil/sediment and water), and will be used as Matrix Spike and Matrix Spike Duplicate samples for lab QA/QC purposes. These samples will be collected from the soil 2 and surface water 1 locations and analyzed for the HSL + 30.

SECTION B: AQUEOUS SAMPLES:

A total of six aqueous samples (excluding MS spike samples), including two monitor well samples and four surface water samples will be collected during the site inspection.

The two monitor well samples will be collected from wells located on the former Hummel-Lanolin property (not related to Hummel Chemical) near the northern corner of the Foundry Street Complex. Three to five times the volume of water in each well will be evacuated from the well before sampling is initiated. Centrifugal pumps with dedicated polyethylene tubing will be used to pump each well. Samples will be collected using dedicated teflon bailors and nylon string. All samples will be analyzed for the HSL + 30.

The four surface water samples will be collected from locations SW-1 through SW-4 as labelled on the attached map. These samples will be collected from the on site drainage system, and will be analyzed for the HSL + 30.

SECTION C: SOIL/SEDIMENT SAMPLES:

A total of fifteen soil samples and five sediment samples (excluding the MS spike samples) will be collected during the site inspection. Fourteen of the soil samples will be collected from locations SOIL-1 through SOIL-14 as labelled on the attached map and analyzed for the HSL + 30. All of these samples will be collected at a depth of 0 to 6 inches, with the exception of sample SOIL-3 which will be collected at a depth of 4 to 4.5 feet, and SOIL-4 which will be collected at a depth of 1.0 to 1.5 feet. Three soil samples will be collected from locations SOIL DIOX-1 through SOIL DIOX-3 as labelled on the attached map, and analyzed for the 2,3,7,8 TCDD dioxin isomer. These samples will be collected at a depth of 0 to 6 inches. Two soil samples, SOIL-15 and SOIL DIOX-4, will be collected from an offsite location to be determined on the date of sampling and will be analyzed for HSL + 30 and the 2,3,7,8 TCDD dioxin isomer, respectively. Both samples will be collected at a depth of 0 to 6 inches and serve as indicators of background soil conditions.

The five sediment samples will be collected from locations SED-1 through SED-5 as labelled on the map. These samples will be analyzed for the HSL + 30.

All soil/sediment samples will be collected using lab cleaned and dedicated stainless steel bucket augers will be utilized when necessary.

SECTION D: PROCEDURES AND EQUIPMENT:

Lab cleaned and dedicated teflon bailors will be used to collect samples from the two monitor wells. Three to five times the volume of water in each well will be evacuated from the well before sampling is initiated. Centrifugal pumps with dedicated polyethylene tubing will be used to purge both wells.

Lab cleaned and dedicated stainless steel trowels will be used to collect all soil and sediment samples. Lab cleaned and dedicated stainless steel bucket augers will be used as necessary to assist in sample collection.

NJDEP sampling procedures and protocol will be followed at all times.

SECTION E: COSTS:

WESTON LABORATORY PRICES:

	<u>ANALYSIS</u>	<u>COST EACH</u>	<u>TOTAL COST</u>
20 Soil/Sediment Samples	HSL + 30	\$1,725.00	\$34,500.00
2 Groundwater Samples	HSL + 30	\$1,600.00	\$ 3,200.00
4 Surface Water Samples	HSL + 30	\$1,600.00	\$ 6,400.00
5 Soil Samples	2,3,7,8 TCDD	\$ 450.00	\$ 2,250.00
1 Field Blank	HSL + 30	\$1,600.00	\$1,600.00
1 Trip Blank	VOA	\$ 400.00	<u>\$ 400.00</u>
			\$48,350.00

SECTION F: SHIPPING AND HANDLING:

Samples will chain of custody sealed in coolers provided by Weston Laboratories and shipped back to Weston via Federal Express (overnight). Weston's Federal Express No. is 0191-1273-0. Samples will be kept at 4°C at all times.

SECTION G: RECOMMENDATIONS:

Due to the potential for dioxin contamination within the buildings formerly occupied by the Hummel Chemical Company and the Diamond Shamrock Corporation, additional sampling inside the buildings is necessary. These samples may include wipe, chip and possibly air samples collected at strategic locations such as old exhaust fans, floors, window panes, trusses, etc.

All actions undertaken at the site will be coordinated with the NJDEP/Division of Hazardous Waste Management/Metro Field Office.

Further recommendations will be based on review of the samples analyses from the 10/14/88 site inspection.

RB:mz



State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE MANAGEMENT

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(609) 633-1408

Lance R. Miller
Deputy Director

Hazardous Waste Operations

Responsible Party Remedial Action

M E M O R A N D U M

TO: Richard Gervasio, Supervising Environmental Technician
Bureau of Planning and Assessment

FROM: Robert Beretsky, HSMS III *KB*
Bureau of Planning and Assessment

SUBJECT: SAMPLING EPISODE REPORT FOR THE HUMMEL CHEMICAL
(AKA: FOUNDRY STREET) SITE

MAR 15 1988

PURPOSE:

To outline sampling activities conducted by Bureau of Planning and Assessment personnel at the subject site.

NJDEP REPRESENTATIVES:

RICHARD GERVASIO, SUPERVISORY ENVIRONMENTAL TECHNICIAN
CLARE SULLIVAN, HSMS III
EDWARD GAVEN, HSMS III
DAVID VAN ECK, HSMS III
ROBERT RAISCH, HSMS III
CHRISTINA HOLSTROM, HSMS III
FRANK SORCE, HSMS IV
ROBERT BERETSKY, HSMS III

DATE OF SAMPLING: October 14, 1988

DATE OF REPORT: October 26, 1988

COMMENTS:

The Hummel Chemical Company formerly processed a variety of chemicals from a small industrial complex located at 185 Foundry Street in Newark from the mid 1950's to the mid 1960's. Although the exact nature of Hummels operations at the Foundry Street site are unknown, it appears most of the processing occurred through mixing and blending of powdered chemicals. Some of the chemicals reportedly used by Hummel are considered Class III Dioxins precursors. It is unknown exactly what building(s) Hummel may have occupied at the Foundry Street complex.

The entire Foundry Street complex has a long history of occupancy by a variety of chemical related industries dating back to at least 1931. In the early 1930s, the site was utilized by H.A. Metz Laboratories for

the manufacture of drugs (not specified). According to the Sandborne Fire Insurance maps for 1931, many of buildings occupied by H.A. Metz were used as labs. Also at this time, the northeastern portion of the property was undeveloped.

In the 1950s at least two industries, Chemical Industries Inc. and the Arkansas Chemical Company, occupied the site. Arkansas, located at the extreme southern portion of the site, manufactured textile related chemicals until approximately 1982. The type of operations undertaken by Chemical Industries Inc. is unknown but it is believed they may have leased some buildings to other chemical companies. Many of the buildings were again labeled for laboratory use on the 1950 Sandborne Map.

Currently, the Foundry Street Complex is comprised of approximately 30 buildings, many of which still house chemical related industries. These industries include the Sun Chemical Company, Conus Chemical Company, Avon Drum Company and Automatic Electroplating.

Most of the buildings are in close proximity separated only by small alleyways. The alleyways throughout the site are bisected by common storm drains which receive contaminated runoff and in some instances, direct discharges from the various industries. Samples collected from one of the storm drains near the Sun Chemical Company as part of Sun Chemical's ECRA submittal revealed high concentrations of volatile organics. Since the storm drains are common to all of the industries and due to the long history of industrial use at the site, it is difficult to assess which industries are the actual contributors to contamination in the drains.

Most of the site is covered with concrete, asphalt, and/or buildings, but many exposed surfaces are stained from apparent releases of chemicals. Also many of the "covered" areas are cracked or consist only of cobblestone, thereby permitting any releases to easily migrate to the soil.

A presampling assessment conducted by NJDEP personnel on October 7, 1988 revealed most of the exposed soil surface is stained and appears to be saturated with chemicals. Pools of multicolored chemicals were observed in many areas around the site, especially near Conus Chemical. Poor housekeeping practices appear to be commonplace by almost all of the industries within the complex. Drums of hazardous substances were being stored throughout the site in insecure areas which lacked adequate secondary containment. Many of the drums were leaking and in poor condition.

During the presampling assessment, soil gas readings were obtained throughout the site using an HNu photoionizer and an OVA flame ionizer in the survey mode. Readings obtained on the HNu ranged from background (0.6 ppm as benzene) to over 600 ppm; those on the OVA ranged from 10 ppm as methane to over 1000 ppm. Ambient air readings ranged from background (1.0 ppm) to over 10 ppm on the OVA.

Based on information obtained during the presampling assessment, further investigation was deemed necessary.

Scheduled for sampling on 10/14/88 were eighteen soil samples, five sediment samples, four surface water samples and two groundwater samples. All of the samples, with the exception of four soil samples, are to be

ATTACHMENT H

sampled for the Hazardous Substance List + 30 peaks. The other four soil samples are to be analyzed for the 2, 3, 7, 8 TCDD dioxin isomer.

It should be noted corrective actions were needed at several sample locations and will be discussed in the sections pertaining to these samples.

SAMPLING EPISODE: Weather: sunny; 55°F

0720:

Richard Gervasio, Edward Gaven, David Van Eck, Frank Sorce and Robert Beretsky arrive on site.

0725:

Clare Sullivan, Robert Raisch and Christina Holstrom arrive on site.

0830:

All shuttle seals are broken by Richard Gervasio and Robert Beretsky (See pages 9-15 for sample numbers and corresponding seal numbers).

0830-0840:

Sampling team sets up decontamination line along northern portion of site near Conus Chemical.

0840-0850:

Robert Beretsky escorts sampling team around site to exhibit the sample locations.

0855-0920:

David Van Eck and Frank Sorce collect Soil 2 (BSA10148467) from behind a warehouse associated with the Arkansas Chemical Company operations (Soil 2 as labeled on attached map). The sample was obtained at a depth of 6 to 12 inches below grade and was described as dark brown to black sand and gravel. The sample location was photographed.

0900-0905:

Edward Gaven and Robert Raisch obtain Soil 10 (BSA10148475) from the eastern side of the Avon Drum Company yard area (Soil 10 as labeled on attached map). The sample was described as dark brown silty sand and clay mixed with black fill material. The sample was collected at a depth of 0 to 6 inches. A photograph was taken of the sample location.

0900-0905:

Sediment 3 (BSA10148483) is collected by Clare Sullivan and Christina Holstrom from the storm drain located in the alleyway between the four story building formerly associated with Arkansas Chemical Company and the current Automatic Electroplating Company Building #22 (Sediment 3 as labeled on attached map). The sample is obtained at a depth of 0 to 6 inches and is described as black tarry soil. The sample location was photographed by NJDEP/DHWM/BPA personnel.

0915-0925:

Clare Sullivan and Christina Holstrom obtain Sediment 2 (BSA10148476) from the drainage ditch reportedly emanating from Sun Chemical's wastewater treatment system (SED 2 as labelled on map). The sample was collected at a depth of 0 to 6 inches and was described as purple sandy sediment

ATTACHMENT H

intermixed with small pebbles. The sample location was photographed by NJDEP/DHWM/BPA personnel.

0925-0930:

Edward Gaven and Robert Raisch obtain Soil 11 (BSA10148476) from the yard area of the Avon Drum Company along the fenceline of Avon Drum and the former Hummel-Lamolin property (Soil 11 as labelled on attached map). The sample was taken at a depth of 6 to 8 inches and was described as dark brown to black silt and yellow brown clay. Readings of 10 to 20 ppm as methane were obtained on the OVA directly over the sample location. The sample location was changed from that proposed in the sampling plan (near the center of Avon Drum Company's yard area) due to the very hard soil surface encountered at the proposed location. NJDEP/DHWM/BPA personnel photographed the sample location.

0930-0945:

Clare Sullivan and Christina Holstrom collect Soil 1 (BSA10148466) from near a drum storage area on the Sun Chemical site (Soil 1 as labeled on map). The sample was described as oil stained soil and was collected at a depth of 0 to 6 inches. The sample location was photographed by NJDEP/DHWM/BPA personnel.

0935-0940:

Edward Gaven and Robert Raisch obtain Soil 12 (BSA10148477) from the yard area of the Avon Drum Company near the northern fence line bordering Roanoke Avenue (Soil 12 as labeled on map). The sample was collected at a depth of 0 to 6 inches and was described as dark brown silty sand. The sample location was photographed by NJDEP/DHWM/BPA personnel.

0950-0955:

Soil 13 (BSA10148478) was collected by Edward Gaven and Robert Raisch along the northern fenceline of the Avon Drum Company yard area, directly west of soil location 12 (Soil 13 as labeled on map). The sample was collected at a depth of 0 to 6 inches and was described as dark brown to black soil and green-red clay. Readings ranging from 200 to 300 ppm as methane were recorded on the OVA over disturbed soil within the sample location. The sample location was photographed by NJDEP/DHWM/BPA personnel.

0950-1015:

David Van Eck and Frank Sorce collect Soil 3 (BSA10148468) from within the Soil 2 sample boring (Soil 3 as labeled on map). The sample was obtained at a depth of 1.5 to 2 feet below grade and was described as dark black oily sand and gravel. This sample was to be collected at a depth of 4 to 4.5 feet below grade, however due to the excessive amounts of gravel encountered, this depth could not be achieved. The sample location was photographed by NJDEP/DHWM/BPA personnel.

1010-1015:

Soil 14 (BSA10148479) is collected by Edward Gaven and Robert Raisch in the yard area of the Avon Drum Company, between rows of stacked drums (Soil 14 as labeled on map). The sample was described as black soil with a petroleum odor. A reading of 100 ppm as methane was recorded over disturbed soil within the sample location. The sample was collected at a depth of 0 to 6 inches. The sample location was photographed by NJDEP/DHWM/BPA personnel.

1015-1025:

David Van Eck and Frank Sorce obtain Soil 4 (BSA10148469) at a depth of 6 to 8 inches below grade, directly beneath a pipe emanating from the former Arkansas Chemical Company warehouse (Soil 4 as labeled on map). The sample was described as brown sand. This sample location was also changed from that proposed in the sampling plan, as it was believed to be a more appropriate location by sampling team personnel. A photograph was taken of the sample location.

1015-1025:

Clare Sullivan and Christina Holstrom collect Surface Water 1 (BSA10148488) from the drainage ditch between the Sun Chemical (Building #23) and former Arkansas Chemical Company buildings (SW 1 as labeled on map). The sample was obtained from an active flow and is described as clear water with an oil sheen on the surface. The sample location was photographed by NJDEP/DHWM/BPA personnel.

1030-1045:

Soil 5 (BSA10148470) is obtained by David Van Eck and Frank Sorce from beneath one of the former Arkansas Chemical Company buildings in the southeastern corner of the site (Soil 5 on attached map). The sample is described as dark brown to black sand and gravel and is collected at a depth of 6 to 12 inches. The sample location is photographed by NJDEP/DHWM/BPA personnel.

1040-1045:

Clare Sullivan and Christina Holstrom obtain Sediment 1 (BSA10148481) from the drainage ditch between the Sun Chemical (building #23) and former Arkansas Chemical Company buildings (Sed. 1 as labeled on map). The sample was described as black grainy soil intermixed with pebbles. The sample was collected at a depth of 0 to 6 inches. The sample location was photographed by NJDEP/DHWM/BPA personnel.

1040-1046:

Richard Gervasio and Robert Beretsky obtain Soil 9 (BSA10148474) from the northern portion of the site near Conus Chemicals' drum storage area (Soil 9 as labeled on map). The sample was collected at a depth of 0 to 6 inches and was described as black oily soil. The sample location was photographed.

1045-1050:

Edward Gaven and Robert Raisch collect Dioxin 3 (BSA10148494) from within the yard area of the Avon Drum Company (Soil Diox 3 as labeled on map). It should be noted this location was not proposed in the sampling plan and Dioxin 3 was to be collected from behind the Arkansas Chemical Company warehouse near Soil Location 2. However, due to a mixup the sample Dioxin 3 was collected from the yard area of the Avon Drum Company and Dioxin 4 obtained from the proposed Dioxin 3 location behind the Arkansas warehouse. Dioxin 4 was initially designated as the background (offsite) dioxin sample.

The Dioxin 3 sample was described as dark brown silt with some clay and was collected at a depth of 0 to 6 inches. The sample location was photographed by NJDEP/DHWM/BPA personnel.

1055-1100:

Richard Gervasio and Robert Beretsky collect Soil 8 (BSA10148473) from near Conus Chemicals' drum storage area, approximately 100'-120' southeast of the Soil 9 sample location (Soil 8 as labeled on map). The sample was collected at a depth of 0 to 6 inches and was described as dark black oil-stained soil. A photograph was taken of the sample location.

1100-1115:

Surface Water 3 (BSA10148490) was obtained by Clare Sullivan and Christina Holstrom from the drainage ditch directly behind Automatic Electroplating (building #22 - SW 3 as labeled on map). The water within this ditch appeared to be static at the time of the site inspection and was described as slightly cloudy, gray to brown water with an oil sheen on the surface. The sample was collected directly within the sample bottles. A photograph is taken of the sample location.

1110-1115:

Dioxin 4 (BSA10148495) is obtained by Edward Gaven and Robert Raisch behind the former Arkansas Chemical Company warehouse near Soil #2 (Soil Diox 4 as labeled on attached map). As was previously stated, Dioxin 4 was to be the background dioxin sample, and Dioxin 3 was to be collected behind the Arkansas warehouse, however, due to a mixup Dioxin 3 was collected in the yard area of the Avon Drum Company and Dioxin 4 was moved to behind the Arkansas warehouse. The sample was collected at a depth of 0 to 6 inches and was described as brown silt and clay. The sample location was photographed by NJDEP/DHWM/BPA personnel.

1115-1120:

Clare Sullivan and Christina Holstrom collect Sediment 4 (BSA10148484) from the drainage ditch located directly behind the Automatic Electroplating Building #22 (SED 4 as labeled on attached map). The sample was taken within the drainage ditch at a depth of 0 to 6 inches. The drainage ditch is approximately 1.5 feet below existing grade. The sample was described as black, grainy sediment intermixed with small pebbles. A photograph is taken of the sample location.

1120-1125:

Edward Gaven and Robert Raisch collect Dioxin 2 (BSA10148493) from between the Automatic Electroplating (Building #22) and the former Arkansas Chemical Company buildings (Soil Diox 2 as labeled on map). The sample was obtained by scraping soil from between cobblestones in the alleyway between the two buildings. The sample was described as loose sandy material. The sample location was photographed by NJDEP/DHWM/BPA personnel.

1130-1135:

Robert Raisch and Edward Gaven obtain Dioxin 1 (BSA10148492) from near the dumpster on the Sun Chemical site (Soil Diox 1 as labeled on attached map). The sample was described as brown to black silty clay with some purple coloration. The sample was collected at a depth of 0 to 6 inches. A photograph was taken of the sample location.

1205-1215:

Sediment 5 (BSA10148485) was collected by Clare Sullivan and Christina Holstrom from within the drainage ditch located between buildings currently occupied by RFE and Conus Chemical (SED 5 as labeled on map). The sample was collected at a depth of 0 to 6 inches and was described as grainy soil

with tan streaks. Standing water present in the drainage ditch was noted to have an oily sheen. The sample location was photographed by NJDEP/DHWM/BPA personnel.

1210-1215:

Edward Gaven and Robert Raish collect Surface Water 4 (BSA10148491) from a drainageway located between Automatic Electroplating (building #23) and CWC Industries (building #18-SW 4 as labeled on map). An active flow was noted in the drainageway during the site inspection. The sample was described as having oily sheen on the surface and possessing an undetermined odor. A photograph was taken of the sample location. This sample location was changed from that proposed in the sampling plan since there was no water in the proposed location at the time of the site inspection.

1215-1230:

Clare Sullivan and Christina Holstrom collect Soil 7 (BSA10148472) from just outside the demolished section of building formerly occupied by the Honig Chemical Company (Soil 7 as labeled on map). The sample was obtained at a depth of 0 to 6 inches and was described as dark brown sandy soil with yellow flecks. The yellow flecks somewhat resembled hexavalent chromium. The sample location was photographed by NJDEP/DHWM/BPA personnel.

1215-1230:

Richard Gervasio and David Van Eck collect groundwater samples from Monitor Wells 1 and 2 located on the former Hummel-Lanolin property. The wells were installed within 50 feet of one another near Hummel-Lanolins' former underground tank. These wells are also considered downgradient of the remainder of the 185 Foundry Street site.

Monitor Well 1 was hand bailed to dryness prior to sample collection. It was estimated 1 gallon of water was purged from the well. Due to the extremely slow recovery of the well only two 40 ml volatile organic bottles and one half of the one liter metals container were able to be filled. The sample was described as black water.

Monitor Well 2 was also hand bailed to dryness prior to sample collection. Here again, the well did not completely recover and only the two 40 ml volatile organic bottles and one half of the one liter metals container could be filled. The sample was described as black water. Both wells were photographed.

1230-1240:

Edward Gaven and Robert Raisch obtain Surface Water 2 (BSA10148489) from the drainage ditch located near Automatic Electroplating (Building #23), Fleet Autoelectric (Building #29), and CWC Industries (Building #18). This sample corresponds to SW2 as labeled on the attached map. The sample was described as cloudy, standing water and was collected directly within the sample bottles. The sample location was photographed by NJDEP/DHWM/BPA personnel.

1230-1245:

Soil 15 (BSA10148480) is collected by Richard Gervasio and Robert Beretsky across Roanoke Avenue, north of Conus Chemical (Soil 15 on attached map). The sample was described as loose brown dirt and was collected at a depth of 0 to 6 inches. This sample is considered the background soil sample. A photograph is taken of the sample location.

1240-1245:

Clare Sullivan and Christina Holstrom collect Soil 6 (BSA10148471) from behind the former Arkansas Chemical Company buildings (Soil 6 on map). The sample is taken at a depth of 0 to 6 inches and is described as black to dark brown soil. A photograph was taken of the sample location.

1245-1300:

Richard Gervasio and Robert Beretsky decon sample team personnel.

1300-1330:

Clare Sullivan and Robert Beretsky complete chain of custody and sample analysis request forms.

1345-1400:

Samples are placed in appropriate shuttles and the shuttles sealed for shipment back to Weston Laboratories.

1400:

Clare Sullivan, Robert Raisch, Christina Holstrom, Edward Gaven, David Van Eck and Frank Sorce depart from site.

1415:

Richard Gervasio and Robert Beretsky depart from site.

1440:

Richard Gervasio and Robert Beretsky deliver sealed shuttles to the Federal Express Office. Four shuttles to be shipped to Weston Labs in Lionville, Pa. are assigned Airbill #289222500.

CONCLUSIONS:

All samples were collected in accordance with methodologies outlined in the NJDEP Sampling Procedures Manual.

Photographs taken during the site inspection are in the custody of the NJDEP/Division of Hazardous Waste Management/Bureau of Planning and Assessment.

RECOMMENDATIONS:

Due to the potential for dioxin contamination within the buildings formerly occupied by the Hummel Chemical Company and the Diamond Shamrock Corporation, additional dioxin sampling inside the buildings is necessary. These samples may include wipe, chip, and possibly air samples at strategic locations such as old exhaust fans, cracks/seams in floors, window panes, trusses, etc.

Additional sampling of the monitor wells is also recommended. Analysis of the samples should be for parameters not obtained during the October 14, 1988 site inspection. These parameters include the following HSL sample fractions; Acid Extractables/Base Neutrals, Pesticides/PCBs, and Metals (if sample collected on October 14, 1988 can not be analyzed). It is highly recommended petroleum hydrocarbon analysis also be performed on the groundwater samples.

Further recommendations will be based on review of analytical data generated from the October 14, 1988 site inspection.

WESTON SAMPLES

<u>SAMPLE #</u>	<u>SHUTTLE SEAL # UPON ARRIVAL AT BPA OFFICE</u>	<u>SHUTTLE RESEAL # FOR SHIPMENT BACK TO WESTON LABS</u>	<u>LOCATION</u>	<u>ANALYSIS</u>	<u>COST EACH</u>
BSA10148473	SEE NOTE *	BSA10148-3	SOIL 8 ON MAP-NEAR DRUM STORAGE AT CONUS CHEMICAL.	HSL + 30	\$1725.00
BSA10148474	SEE NOTE *	BSA10148-3	SOIL 9 ON MAP-NEAR DRUM STORAGE GATE AT CONUS CHEMICAL.	HSL + 30	\$1725.00
BSA10148475	SEE NOTE *	BSA10148-3	SOIL 10 ON MAP- SOUTHEAST CORNER OF AVON DRUM.	HSL + 30	\$1725.00
BSA10148476	SEE NOTE *	BSA10148-3	SOIL 11 ON MAP- WESTERN BORDER OF AVON DRUM, NEAR FENCELINE OF FORMER HUMMEL-LANOLIN PROPERTY.	HSL + 30	\$1725.00
BSA10148477	SEE NOTE *	BSA10148-3	SOIL 12 ON MAP-AVON DRUM CO. NEAR FENCE BORDERING ROANOKE AVE.	HSL + 30	\$1725.00
BSA10148478	SEE NOTE *	BSA10148-3	SOIL 13 ON MAP- AVON DRUM CO. NEAR FENCE BORDERING ROANOKE AVE., WEST OF SOIL 12 LOCATION.	HSL + 30	\$1725.00

WESTON SAMPLES

<u>SAMPLE #</u>	<u>SHUTTLE SEAL # UPON ARRIVAL AT BPA OFFICE</u>	<u>SHUTTLE RESEAL # FOR SHIPMENT BACK TO WESTON LABS</u>	<u>LOCATION</u>	<u>ANALYSIS</u>	<u>COST EACH</u>
BSA10148479	SEE NOTE *	BSA10148-3	SOIL 14 ON MAP- AVON DRUM CO. BETWEEN ROWS OF STACKED DRUMS.	HSL + 30	\$1725.00
BSA10148480	SEE NOTE *	BSA10148-3	SOIL 15 ON MAP-ACROSS ROANOKE AVE., NORTH OF CONUS CHEMICAL CO.- BACKGROUND.	HSL + 30	\$1725.00
BSA10148481	SEE NOTE *	BSA10148-3	SED 1 ON MAP-DRAINAGE DITCH BETWEEN SUN CHEMICAL AND FORMER ARKANSAS CHEM. CO. BUILDINGS.	HSL + 30	\$1725.00
BSA10148482	SEE NOTE *	BSA10148-3	SED 2 ON MAP-DRAINAGE FROM SUN CHEMICAL SITE REPORTEDLY LEADING TO PVSC.	HSL + 30	\$1725.00
BSA10148483	SEE NOTE *	BSA10148-3	SED 3 ON MAP-DRAINAGE DITCH BETWEEN AUTOMATIC ELECTROPLATING & FORMER ARKANSAS CHEMICAL CO. BUILDINGS.	HSL + 30	\$1725.00
BSA10148484	SEE NOTE *	BSA10148-3	SED 4 ON MAP-DRAINAGE DITCH BEHIND AUTOMATIC ELECTROPLATING.	HSL + 30	\$1725.00

ATTACHMENT H

WESTON SAMPLES

<u>SAMPLE #</u>	<u>SHUTTLE SEAL # UPON ARRIVAL AT BPA OFFICE</u>	<u>SHUTTLE RESEAL # FOR SHIPMENT BACK TO WESTON LABS</u>	<u>LOCATION</u>	<u>ANALYSIS</u>	<u>COST EACH</u>
BSA10148485	SEE NOTE *	BSA10148-3	SED 5 ON MAP-NORTHERN PORTION OF SITE IN DRAINAGE DITCH BETWEEN RFE AND CONUS CHEM. CO.	HSL + 30	\$1725.00
BSA10148486	SEE NOTE *	BSA10148-1	MW 1	VOA + METALS	\$700.00
BSA10148487	SEE NOTE *	BSA10148-1	MW 2	VOA + METALS	\$700.00
BSA10148488	SEE NOTE *	BSA10148-1	SW 1 ON MAP-SAME AS SED 1 LOCATION.	HSL + 30	\$1600.00
BSA10148488 MS	SEE NOTE *	BSA10148-1	SAME AS SW 1	HSL + 30	NO CHARGE
BSA10148488 MSD	SEE NOTE *	BSA10148-1	SAME AS SW 1	HSL + 30	NO CHARGE
BSA10148489	SEE NOTE *	BSA10148-2	SW 2 ON MAP-COMMON ALLEYWAY BETWEEN AUTOMATIC ELECTRO- PLATING, CWC AND FLEET AUTOELECTRIC.	HSL + 30	\$1600.00
BSA10148490	SEE NOTE *	BSA10148-1	SW 3 ON MAP-SAME AS SED 4 LOCATION.	HSL + 30	\$1600.00
BSA10148491	SEE NOTE *	BSA10148-2	SW 4 ON MAP-DRAINAGE WAY BETWEEN AUTOMATIC ELECTROPLATING & CWC.	HSL + 30	\$1600.00

WESTON SAMPLES

<u>SAMPLE #</u>	<u>SHUTTLE SEAL # UPON ARRIVAL AT BPA OFFICE</u>	<u>SHUTTLE RESEAL # FOR SHIPMENT BACK TO WESTON LABS</u>	<u>LOCATION</u>	<u>ANALYSIS</u>	<u>COST EACH</u>
BSA10148492	SEE NOTE *	BSA10148-4	SOIL DIOX 1 ON MAP- NEAR DUMPSTER AT SUN CHEMICAL.	2,3,7,8 TCDD	\$ 450.00
BSA10148493	SEE NOTE *	BSA10148-4	SOIL DIOX 2 ON MAP- FROM COBBLES BETWEEN AUTOMATIC ELECTRO- PLATING AND FORMER ARKANSAS CHEMICAL CO. BUILDINGS.	2,3,7,8 TCDD	\$ 450.00
BSA10148494	SEE NOTE *	BSA10148-4	SOIL DIOX 3 ON MAP- APPROXIMATE CENTER OF AVON DRUM SITE.	2,3,7,8 TCDD	\$ 450.00
BSA10148495	SEE NOTE *	BSA10148-4	SOIL DIOX 4 ON MAP- BEHIND FORMER ARKANSAS CHEMICAL CO. WAREHOUSE.	2,3,7,8 TCDD	\$ 450.00
BSA10148496		BSA10148-4	DIOXIN 5-PROFICIENCY SAMPLE - # UNLV-QASL TCDD STD H23BL37Q1.	2,3,7,8 TCDD	\$ 450.00
BSA10148497	SEE NOTE *	BSA10148-1	FIELD BLANK-TROWEL	HSL + 30	\$1600.00
BSA10148498	SEE NOTE *	BSA10148-1	TRIP BLANK	VOA	\$ 400.00
				TOTAL	\$47350.00

* Upon arrival to the BPA office, it was noted that the sample bottles were divided among four shuttles, however the bottles were not organized within each shuttle according to complete HSL sample sets (i.e. Soil Samples consisted of two 40 ml VOA bottles and one 500 ml jar for remaining fractions; water samples consisted of two 40 ml VOA, one 1L plastic CN-container, one 1L plastic metals container, and three 1L amber glass containers for the AE/BN and pesticides/PCBs fractions).

After sample collection, the bottles were rearranged for shipment back to Weston so that entire sample sets would remain together.

The contents of shuttles upon arrival to the BPA office and for shipment back to the lab are as follows:

Shuttle contents upon arrival to BPA

<u>SHUTTLE SEAL #</u> (Weston Seal)	<u>CONTENT</u>
1	20 X 1L amber bottles
2	27 X 500 ml jars 20 X 1L plastic with preservatives (NAOH for CN containers and HNO ₃ for metals containers).
3	20 X 40 ml bottles with HCl. 48 X 40 ml bottles without preservatives. 9 X 1L amber 4 X 40 ml VOA with lab water.
4	6 X 1L amber bottles with lab water. 4 X 12 plastic containers with lab water. 2 X 40 ml VOA with lab water.

Shuttle Contents for Shipment back to Weston

<u>SHUTTLE SEAL #</u> (BPA Seal)	<u>CONTENTS</u>
BSA10148-1	16 X 40 ml VOA 15 X 1L amber 7 X 1L plastic-metals 5 X 1L plastic-cyanide These contents comprised sample #'s: BSA10148486 BSA10148487 BSA10148488 BSA10148488MS

BSA10148488MSD

BSA10148490

BSA10148498

BSA10148499

BSA10148-2

6 X 40 ml VOA

2 X 1L plastic-metals

2 X 1L plastic-cyanides

6 X 1L amber

Contents comprised sample

#'s:

BSA10148489 & BSA10148491

BSA10148-3

22 X 500 ml jars

44 X 40 ml VOA

Contents comprised sample

#'s:

BSA10148466 through

BSA10148485 including

BSA10148467MS and

BSA10148467MSD

BSA10148-4

5 X 500 ml jars

Contents comprised sample

#'s:

BSA10148492 through

BSA10148496

HUMMEL CHEMICAL
AKA 185 FOUNDRY STREET SITE
185 FOUNDRY STREET
NEWARK, ESSEX COUNTY
EPA ID # NJD002174712

GENERAL INFORMATION AND SITE HISTORY

The Hummel Chemical Company formerly operated a chemical warehouse/distribution center out of a small industrial complex from the mid-1950s to the mid-1960s. Operations ceased here in the mid-1960s when the company relocated to South Plainfield, New Jersey. The former site is situated in a heavily industrialized section of Newark with the nearest residential area being located 0.5 mile to the west.

Records show that Hummel leased property at 185 Foundry Street from Norpak/Kem Realty Company in the mid 1960's. The exact building that Hummel occupied cannot be verified; however, company officials speculate that it was building #18.

The entire Foundry Street Complex has a long history of occupancy by a variety of chemical related industries dating back to a least 1931. In the early 1930's H.A. Metz Laboratories manufactured unspecified drugs here while the northeastern portion of the site remained undeveloped. In the 1950s, at least two industries, Chemical Industries Inc. and the Arkansas Chemical Company occupied the site. The type of operations that Chemical Industries Inc. was involved in is unknown; however, they may have leased some portions of their property to other chemical companys. Arkansas Chemical manufactured textile related chemicals in the extreme southern portion of the site until 1982. Other past operators include Cellomar, a Division of Polychrome Inc. and Diamond Shamrock. The dates these companies operated here and types of operations are unknown.

Current operators at the Foundry Street Complex include: Sun Chemical Company, Avon Drum Company, Fleet Auto Electric, Automatic Electroplating, Conus Chemical Company and CWC Industries.

SITE OPERATIONS OF CONCERN

Hummel Chemical operated a chemical warehouse/distribution center for wholesaling chemicals out of their Foundry Street, Newark location. Although little information is available as to the exact operations here, it is likely that they included the reacting and mixing of chemicals, most of which were in the powered form.

According to the EPA publication, "Dioxins", published in 1980, several class III dioxin precursors were present at the Newark location. These chemicals include: 2,4-dinitrophenoxyethanol, 3,5-dinitrosalicylic acid, hexachlorobenzene and picric acid. The identity of additional chemicals present or what types of storage/disposal methods used by the company are unknown.

The company has a history of poor housekeeping and operational practices associated with their South Plainfield facility that may have also occurred at the prior operational facility in Newark.

Hummel possessed no state or federal permits for discharges to the environment from their Newark facility.

During an October 7, 1988 Presampling Assessment (PSA) conducted by New Jersey Department of Environmental Protection (NJDEP), Bureau of Planning and Assessment (BPA) personnel, most of the exposed soil surface at the site appeared to be stained and saturated with chemicals. Pools of multi-colored chemicals were observed as well as drums of hazardous substances, many of which were leaking and stored in insecure areas which lacked secondary containment. For most industries within the complex, poor housekeeping practices seemed to be routine.

Because a variety of chemical companies have operated here since Hummel moved in the 1960s, it is unlikely that current conditions can be attributed to Hummel.

GROUNDWATER ROUTE

Groundwater beneath the site is derived from a two aquifer system. Directly underlying the site is a low yield aquifer consisting of unstratified drift of the Pleistocene age. During an October 14, 1988, NJDEP Site Investigation (SI), groundwater in this aquifer was encountered at 8.5 feet. The groundwater flow in this shallow unconfined aquifer is assumed to be east, southeast towards the Passaic River and Newark Bay. The Triassic Brunswick Formation, which consists of dull red shale interbedded with siltstone and occasional layers of sandstone, is found beneath the unstratified drift. The formation is relatively deep and protected in much of the area by confining clay layers; however, moderate permeability is possible due to extensive fracturing. Because cracks in the sedimentary rocks of the Triassic Age intersect one another at many different angles, water can move in any direction.

Two monitoring wells were sampled during the October 14, 1988, NJDEP SI. Monitoring Wells 1 and 2 are located on the former Hummel-Lanolin (not related to Hummel Chemical) property within 50 feet on one another in order to monitor a former underground storage tank. Monitoring Well 1 is 10.5 feet deep while Monitoring Well 2 is 10.7 feet deep with both wells tapping the shallow unstratified drift-aquifer. Because of the extremely slow recharge rate of the groundwater in this area, the monitoring well samples were analyzed only for Volatile Organic Compounds (VOCs) and metals out of the planned Target Compound List (TCL) plus 30 peaks.

The following table represents the significant monitoring well results:
(note: all results in ppb)

	<u>MW-1</u>	<u>MW-2</u>
benzene	6	4
arsenic	2020	
barium	2200	
cadmium	1530	34.9
copper	2660	
lead	20400	127
mercury	4.2	77.1
zinc	51500	84600

There are numerous industrial wells within a three mile radius that tap the Brunswick Formation, however, groundwater is not used as a potable supply source in the area. Hummel has never possessed any permits or been issued violations for discharges to the groundwater associated with the former Newark facility.

SURFACE WATER ROUTE

The Foundry Street Complex consists of buildings that are in close proximity to each other, separated only by small alleyways. These alleyways run throughout the site and are bisected by common storm drains, which receive stormwater runoff and, in some cases, direct discharges from the various industries. Because the industrial complex is so old, it is not known which, if any, of the storm drains are connected to the Passaic Valley Sewage Authority (PVSA). Any discharges or drains that are not connected would most likely discharge into the nearby Passaic River.

The confluence of the Passaic River, Hackensack River and Newark Bay lies approximately 3000 feet to the east of Foundry Street Complex. These waterways are used for industrial, recreational and commercial purposes.

During the October 14, 1988, NJDEP SI, four surface water and five sediment samples were collected from the storm drains and analyzed for the TCL plus 30 peaks. Numerous contaminants were detected at varying concentrations in both the surface water and sediment samples. Table 1 summarizes the significant results. (note: all results in ppb with the exception of the non-aqueous inorganics which are reported in ppm) See Map 2 for sample locations and Attachment A for sample descriptions.

Because Hummel has not operated here for 25 years, the contamination detected in these samples cannot accurately be connected to their prior operations.

AIR ROUTE

Hummel did not possess any permits or receive any violations for releases to the air from the Newark facility. Since their operations in Newark ceased in the mid-1960s there is currently no potential for contamination of the air; however, migration of air-borne contaminants in the past cannot be ruled out.

During the October 14, 1988, NJDEP SI, ambient air readings of up to 40 ppm as isobutylene on the HNu and over 10 ppm as methane on the OVA were observed. This would indicate that current operations may be contributing to air pollution.

SOIL

On October 14, 1988, NJDEP, BPA collected 15 soil samples to be analyzed for the TCL plus 30 peaks and 5 to be analyzed for the 2,3,7,8-TCDD isomer of dioxin. Although dioxin was not detected in any of the samples, this does not guarantee that it is not present on site. See Map 2 for sample locations and Attachment A for sample descriptions. Table 2 summarizes the significant results.

During the same inspection, the ground surface was observed to be stained throughout the site from chemical spills. Leaking drums with no secondary containment were also noted.

Because of the presence of a variety of chemical companies over the years, it is not likely that any present soil contamination can be attributed to the former Hummel facility.

DIRECT CONTACT

There have been no reported incidents of direct contact in relation to the Hummel operations at this location; however, there is currently a potential for direct contact with contaminated soil due to the absence of 24-hour barriers.

FIRE AND EXPLOSION

There have been no reported fires or explosions directly associated with the Hummel, Newark operations; however, Newark Fire Department personnel recall responding to fires and chemical spills at the Foundry Street Complex but could not recall if any were at the Hummel facility.

ADDITIONAL CONSIDERATIONS

The presence of many bioaccumulative and biomagnification threats such as pesticides, PCBs, mercury, cadmium, and lead in the surface water and soil leads to a potential to damage the flora and fauna and subsequently adversely affecting the food chain. The aquatic ecosystem of the Passaic River, which receives the drainage discharges, would be most immediately affected.

ENFORCEMENT ACTIONS

There are no records of enforcement actions taken against the Hummel, Newark facility.

PRIORITY DESIGNATION

Because damage to human health or the environment is not likely due to the location of the site in a highly industrialized area, a low priority is assigned.

RECOMMENDATIONS

Further investigation of the current operators at the Foundry Street Complex is indicated by the levels of contaminants detected during the October 14, 1988 NJDEP SI. A Responsible Party (RP) search is necessary due to the number of tenants and owners over the years. Following completion of the RP search, the case should be transferred to Case Management for initiation of clean-up activities.

A delineation of the storm drain system should be performed and, if necessary, hook up to the PVSA should be completed.

Submitted by:

Elizabeth Torpey
December, 1989

TABLE 1

RESULTS IN PPB	SW-1	SW-2	SW-3	SW-4	SED-1	SED-2	SED-3	SED-4	SED-5
VINYL CHLORIDE					29				
METHYLENE CHLORIDE									9900
ACETONE									25000
CARBON DISULFIDE								14	
1,1-DICHLOROETHANE				15	2			16	7100
1,2-DICHLOROETHENE				270	5			58	81000
1,2-DICHLOROETHANE									5300
2-BUTANONE						660			5000
1,1,1-TRICHLOROETHANE					12	110			15000
XYLENES	53				200	1800	14	280	99000
TRICHLOROETHENE				7	36			27	3100
BENZENE		.7	7	43		7		7	520
4-METHYL-2-PENTANONE				57		3300			
TETRACHLOROETHENE					3	15		7	10000
TOLUENE	11	.9	4	120	10	130	100	53	96000
CHLOROBENZENE			39	77	32	160	34	970	33000
ETHYLBENZENE	6				35	170		42	
1,3-DICHLOROBENZENE			190					56000	

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RESULTS IN PPB	SW-1	SW-2	SW-3	SW-4	SED-1	SED-2	SED-3	SED-4	SED-5
1,4-DICHLORBENZENE	1		310		21000			84000	
1,2-DICHLOROBENZENE			11						14006
BENZOIC ACID				420					
1,2,4-TRICHLOROBENZENE			51		62000			17000	
NAPHTHALENE			24		1700				36000
2-METHYLNAPHTHALENE					960		2100		68000
PHENANTHRENE							2100		36000
FLUORENE									20000
DI-N-BUTYLPHTHALATE	2	2	8		910	1200	1200	3000	
FLUORANTHENE							2000		6900
PYRENE							2500		11000
BUTYLBENZYLPHTHALATE									53000
BIS(2-ETHYLHEXYL) PHTHALATE	10	11	82	210	4900	3100	33000	37000	2600000
DIELDRIN					170	1900	6700		
4,4'-DDT					84				1200
ARCOLOR-1248					2700	4100	4800	4200	10000
ARSENIC			87.6	132					
BARIUM			2950						468

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AQUEOUS RESULTS IN PPB;
NON-AQUEOUS RESULTS IN PPM

	SW-1	SW-2	SW-3	SW-4	SED-1	SED-2	SED-3	SED-4	SED-5
CADMIUM			810	215			4	14.1	12
CHROMIUM			8880	23500		369		209	512
COPPER			24200	1310				895	323
LEAD			6000	1100			234	482	697
MERCURY			14.2	3.2		12			3.9
NICKEL						347		668	127
SILVER			112	55.1					
ZINC				35,500					
CYANIDE			5580					69	

TABLE 2

7

RESULTS IN PPB

	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8
Chloroform								
1,2-dichloroethane								
Xylenes		52,000				78		
Trichloroethene						30		
4-methyl-2-pentanone						36		
Tetrachloroethene		250	300			13		
Toluene		18				88		
Chlorobenzene		3100		9		7	12	
Ethylbenzene		3400						13
2,4-dichlorophenol								
Naphthalene		1900			850		900	
4-chloroaniline								
2-methylnaphthalene		1900						
2,4,6-trichlorophenol								
2-nitroaniline								
Phenol							5700	

RESULTS IN PPB

	S-9	S-10	S-11	S-12	S-13	S-14	S-15
Chloroform	67						
1,2-dichloroethane	28						
Xylenes		120	490			8300	
Trichloroethene	48					120	
4-methyl-2-pentanone							
Tetrachloroethene	6200	24	69	83	120	160	
Toluene		15	96	27			
Chlorobenzene							
Ehtylbenzene			60	12		3000	
2,4-dichlorophenol							780
Naphthalene							
4-chloroaniline					600		
2-methylnaphthalene	410						
2,4,6-trichlorophenol							380
2-nitroaniline				5800			
Phenol					6500		
1,4-dichlorobenzene							

RESULTS IN PPB

	S-9	S-10	S-11	S-12	S-13	S-14	S-15
Benzoic acid	12,000						
Dibenzofuran							
Diethylphthalate							
Phenanthrene	400			10,000	570		290
Anthracene				55			
Di-n-butylphthalate	1800			590		2800	73
Fluoranthene				13,000	1200		470
Pyrene	1700		9100	10,000	1200	5600	500
Butylbenzylphthalate	1800			590		2800	73
Fluoranthene				13,000	1200		470
Pyrene	1700		4100	10,000	1200	5600	500
Benzo(a)anthracene				5100			250
Chrysene				11,000	1500		310
Bis(2-ethylhexyl) phthalate	2.7×10^7	21,000	7400	11,000		68,000	6600
Di-n-octylphthalate						10,000	
Benzo(b)fluoranthene				7700	1800		250
Benzo(k)fluoranthene				6600	1400		200
Benzo(a)pyrene				5000	1100		200

RESULTS IN PPB

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	S-9	S-10	S-11	S-12	S-13	S-14	S-15
Indeno(1,2,3-cd)pyrene				3300	1100		140
Dibenz(a,h)anthracene							
Benzo(g,h,i)perylene				4100	1500		170
Aldrin							
Dieldrin							15
4,4'-DDD							
Aroclor-1248		1000	65,000	21,000	89,000	17,000	220

RESULTS IN PPM

	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10
Antimony	13.3					23.3	37	13		
Arsenic			25.5	23	31		23.5			
Barium		427	459		529					
Cadmium		3.1	3.1		5.2	15.1	6.6	5.5		
Chromium			395			502	371	158		
Copper			174			1050	283	193	235	
Lead	598	1210	1270	720	594	4090	673	537	242	149
Mercury	1.2					3.4	3.4	9.6		
Nickel			697			398	428	220		
Silver						25.4				
Vanadium			108			388	205			
Zinc		635	554	484	538	1790	1106	1010	79	
Cyanide						131				

RESULTS IN PPM

	S-11	S-12	S-13	S-14
Antimony		27.7	145	27.1
Arsenic		23.5	20.3	78.1
Barium			560	554
Cadmium	9.3	11.4	5.2	5.1
Chromium		1890	5360	797
Copper		269	234	342
Lead	6820	2710	1320	2360
Mercury	9.9		1.8	5.9
Nickel	101	136		
Vanadium		144		
Zinc	1320	1680	1120	1170